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ELECTRODESICCATION & ELECTRO-COAGULATION IN NEOPLASTIC & ALLIED DISEASES OF THE ORAL CAVITY & ADJACENT PARTS*

CLINICAL, PHYSICAL, HISTORICAL & PHOTOGRAPHIC STUDIES BASED UPON 20 YEARS' EXPERIENCE

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PHILADELPHIA

ELECTROTHERMIC methods have a definite field of usefulness in the treatment of neoplastic and allied diseases within the mouth and adjacent parts. One who depends upon any single method, however, may hope to attain but a limited degree of success.

Experience has taught me that operative surgery, electrothermic methods, radium and roentgen rays are all factors of such importance that none of them can be eliminated. All these are employed in my hospital,[1] either alone or in combination, to meet particular indications, and if it became necessary to eliminate any one of them, I would be seriously handicapped.

I hold no brief for any particular method, but experience has demonstrated to me the extreme importance of electrothermic methods. I consider them second to none, and, in many emergencies, superior to all others.

It is my desire to emphasize the importance of electrothermic methods without detracting from the others, devoting this paper to a discussion of the rationale, instrumentation, technique, clinical observations and histologic findings, with indications for and contraindications to their employment. The types of cases in which electrothermic methods stand supreme will be stressed, and a sound basis for their employment will be demonstrated.

ELECTROTHERMIC METHODS

Two tissue changes produced by high frequency currents will be considered. These are classified descriptively, in accordance with the actual effects produced in the tissues, as desiccation and coagulation.

The Desiccation Method. The desiccation method is one by means of which benign and malignant growths of small or moderate size may be destroyed by the utilization of heat of just sufficient intensity to desiccate or dehydrate the tissue. The heat is produced by a monopolar high frequency current of the Oudin type, the

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current being conducted to the lesions by means of a steel needle or other pointed metallic applicator. A single spark gap is usually employed in the circuit, although a multiple gap that is subject to refined regulation may be used.

The desiccation effect, as originally described by me, was produced by a high tension static current, transformed into a high frequency current of suitable quality by means of Leyden jars of proper capacity and a resonator supplying the correct inductance. Since the advent of the modern transformer type of high frequency machine, it has been shown that desiccation can be satisfactorily produced with the latter apparatus.

There is an impression among many of the profession that the desiccation and coagulation methods are one and the same. This is an error, since the effects produced on the tissues are quite different and can be readily demonstrated, both clinically and histologically. The Oudin current, by which desiccation is produced, is of relatively high voltage and low amperage, whereas the d'Arsonval current, by which coagulation is produced, is of lower voltage and higher amperage.

A milliampere meter cannot be used to measure accurately a monopolar current. The proper current strength necessary to destroy growths of different types and sizes within the mouth or elsewhere can be learned only by experience. The desiccation effect may be produced in the tissues by delivering the current through a short air space, by just touching the surface or by inserting a needle more or less deeply, according to the degree of destruction desired.

The desiccation method is used advantageously when the lesion is comparatively superficial and localized, and when it is desired to avoid a contracted cicatrix. It is subject to such perfect control that an exceedingly small growth, even on the cornea of the eye, can be successfully treated without impairment of vision by the subsequent formation of scar tissue. A small growth on the vocal cords may likewise be destroyed without impairing the voice. It will thus be seen that this method can be employed advantageously in the treatment of such lesions in the mouth as leukoplakia, papilloma, angioma, Vincent's or other localized infections, lupus vulgaris, infected tonsils, exostoses, epulis, sarcoma, localized epithelioma, etc. The comparatively slight trauma to the tissues and the mild secondary inflammation explain, from a histologic standpoint, the slight scarring and the success obtained in treating delicate structures.

The Coagulation Method. Coagulation is produced by a bipolar high frequency current of the d'Arsonval type, a multiple spark gap being employed. It is more penetrating and intense than the desiccation method, and in accessible locations is utilized to destroy larger growths, even those involving bone.

There are many variations of technique in the application of this method to suit the requirements of the individual case. These cannot very well be described, but must be learned from practical experience. The active electrode should always be pointed. Steel sewing needles of various lengths may be employed. If still greater length is desired, metallic knitting needles or stiff wire cut to any length may be used, either straight or curved, so as to be adapted to particular anatomic locations. Since the effect of high frequency currents is, or at least as far as can be ascertained, entirely thermic, and not electrolytic, it does not matter, for practical purposes, what particular metal is used. As it is impossible to insulate these electrodes thoroughly, care must be taken that only such tissues as are undergoing treatment shall be touched. The indifferent electrode that is necessary in this method may be of any material that will conduct electricity, such as a bare metallic plate, or, preferably, a moistened asbestos pad covered with a metallic plate or wire mesh and bound together with heavy cloth, such as linen or duck. This should be placed in

close contact with the skin of the patient's back. Both the active and the indifferent electrodes are connected by insulated wires to either side of the d'Arsonval winding of the high frequency machine. Good contact in all the circuit connections is of great importance. A meter should be connected in this circuit as a guide to the current strength employed, which varies from about 200 to 2500 ma., according to the size of the growth to be treated. The meter is not an infallible guide in estimating the action of the current, since the reading is also influenced by the size of the patient under treatment, or, in other words, by the amount of resistance in the circuit.

Doyen's method of coagulation consisted in the use of a blunt metallic electrode applied directly on the growth, and another of the same or larger size at some point near the growth. It has been shown that the control by this technique is imperfect, and experience has taught me that the pointed active and the large passive electrode offer a superior method of application. While the current is passing, the needles may either touch the surface of the growth or be inserted into it, this depending on the depth of destruction desired. In pedunculated growths, a metal snare may be used to advantage as the active electrode.

As already stated, the d'Arsonval current, by which coagulation is produced, is of relatively low voltage and high amperage. If a short air space intervenes between the growth and the needle, the current will be conducted to the tissue in the form of convective sparks, which sometimes approach the intensity of a flame, this depending on the frequency of the oscillations of the circuit. Under such conditions the coagulation will be superficial. On the other hand, if the active electrode remains in close contact with the growth, heat will be generated in the tissues without the production of sparks. Under these conditions the tissues will be deeply coagulated, the actual depth depending on the duration of the application. Better control of coagulation can be acquired by inserting the needle applicator into the tissues to the desired depth, and thus shortening the treatment period.

Unlike the heat generated by these high frequency currents, which penetrates deeply into the tissues, that produced by the actual cautery is comparatively superficial in action. The former is generated within the tissues by their resistance to the current, while the latter is merely transmitted by contact. Whether the desiccation or coagulation method is employed, the aim should be to destroy the growth at a single operation.

In lesions of the body surface, the devitalized tissues should, as a rule, be removed immediately, either by excision or curettage, which usually may be accomplished without hemorrhage. If necessary, the base may then receive further treatment. Excision or curettage following electrothermic treatment is practiced less frequently in lesions within the mouth than upon the skin surface, owing to the greater danger of secondary hemorrhage because of maceration of the tissues by secretions and also by bacterial invasion. Therefore, with certain exceptions, the destroyed tissue is allowed to separate slowly. Bone that has been treated will sequestrate in about six weeks if a current of proper intensity has been employed.

Electrothermic Methods and Irradiation. In dealing with localized benign or malignant lesions, the superiority of the electrothermic methods over irradiation is shown by definite histologic changes and by comparison of permanent clinical results. With electrothermic methods, only diseased tissue is destroyed, the vitality of the surrounding normal structures being conserved. Subsequent treatments, should they be necessary, offer as good prospects of success as though the tissue had not received previous treatment.

On the other hand, with irradiation of such intensity to influence a malignant growth, it is impossible not to lower the

NOTE. A display of photographs before and after treatment has always been distasteful to me, and would be avoided if the message could be otherwise conveyed. Therefore, against my own personal inclination, such illustrations are submitted at the request of the editor. A vast number of photographs are in my files demonstrating that the results shown are not exceptional. The diagnosis in each instance has been confirmed by laboratory findings, it being the practice to biopsy every case admitted to my hospital.

It is regretted that sufficient space could not be allotted to include photomicrographs of sections of the cases illustrated, and also statistical studies. These will, however, be included together with a broad presentation of original work concerning cancer and its treatment, in my book now in preparation.

Acknowledgment and thanks are given for assistance in preparing histological data to Dr. Victor A. Neujean, pathologist to the Clark Hospital.

PLATE I

FIG. 1. Basal cell epithelioma after desiccation. Cells appear as long drawn-out slender threads, whole presenting a mummified appearance.

FIG. 2. Squamous cell epithelioma treated by coagulation, showing hyalinization and several sharply defined thrombosed vessels. Tumor cells have fused into a structureless homogeneous mass.

FIG. 3A. Squamous cell epithelioma, grade 3, of lower lip and buccal surface.

FIG. 3B. Result of one coagulation operation and radium treatment to cervical lymph nodes.

FIG. 4A. Angiofibroma of upper lip.

FIG. 4B. Result of one desiccation treatment under local anesthesia. Note absence of contracted scar.

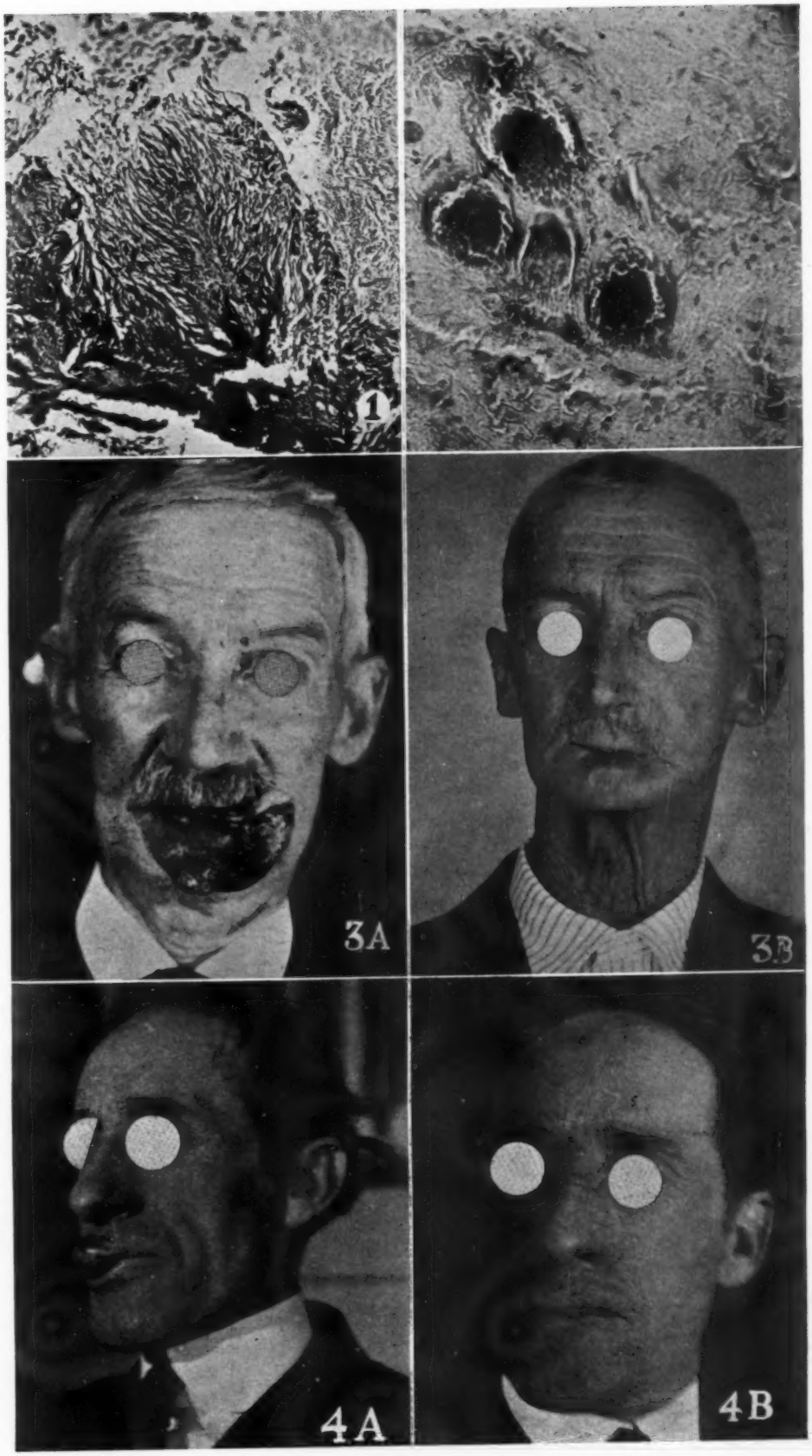

PLATE 1

PLATE II

FIG. 5A. Basal cell epithelioma involving upper lip, antrum, septum, nose, alveolus and hard palate. Three years' duration.

FIG. 5B. Result of one coagulation treatment. No recurrence in twelve years. Photograph taken ten years after operation.

FIG. 5C. Features reconstructed by sculpture method and attached to spectacle frames.

FIG. 6A. Squamous cell epithelioma, grade 4, of floor of mouth.

FIG. 6B. Result of one desiccation treatment and radium to cervical lymph nodes. No recurrence in five years.

FIG. 7A. Squamous cell epithelioma, grade 4, involving cheek through to buccal surface.

FIG. 7B. Result of one coagulation treatment and radium to neck. No recurrence in three years. Plastic operation to close opening is contemplated.

FIG. 8A. Extensive squamous cell epithelioma, grade 2, of tongue and floor of mouth.

FIG. 8B. Appearance after amputation by coagulation, and radium treatment to lymphatic drainage areas in neck. Soft pliable cicatrix. Patient later died of cervical metastasis, without local recurrence.

FIG. 8C. Showing artificial tongue made of moist cotton, materially improving speech.

PLATE II

Plate III

Fig. 9A. Extensive squamous cell epithelioma, grade 3, involving hard palate, alveolus, antrum, floor of orbit, and buccal surface.

Fig. 9B. Incision necessary to throw back flap to expose diseased tissue and bone. Healed by first intention with only slight scar.

Fig. 9C. Opening in antrum with mouth open. No recurrence in five years.

Fig. 9D. Type of denture that may be employed to close opening into maxillary sinus, preventing food and air from entering, thus promoting comfort and insuring normal speech.

Fig. 10A. Advanced basal cell epithelioma involving cheek, parotid gland and osseous structures. Had resisted many forms of treatment.

Fig. 10B. Result of one coagulation treatment under ether anesthesia. No recurrence in twelve years.

Fig. 11A. Mixed cell sarcoma of cheek and lower jaw, extending through into mouth.

Fig. 11B. Result of combined radium needle, desiccation, and operative surgery. Localized broken-down area was treated at angle of jaw, which does not show in photograph, and diseased bone removed with rongeur forceps. No recurrence in seven years.

Fig. 12A. Squamous cell epithelioma, grade 2, of nose, upper lip and septum.

Fig. 12B. Result of one desiccation treatment under local anesthesia.

Fig. 12C. Artificial nose attached to spectacle frames.

PLATE III

PLATE IV

FIG. 13A. Small round cell sarcoma with melanotic tendency, of bulbar conjunctiva and cornea. Recurred twice after two surgical excisions.

FIG. 13B. Result of one desiccation treatment under local anesthesia. There is no perceptible scar and no impairment of vision. No recurrence in seven years. (The desiccation method acts well in many types of corneal and conjunctival growths if involvement is not too deep.)

FIG. 14A. Basal cell epithelioma of upper and lower eyelid and of conjunctiva.

FIG. 14B. Result of desiccation under local anesthesia. Note absence of contracted scar, which is characteristic of results following desiccation if properly performed.

FIG. 15A. Small round cell sarcoma involving tissues of forehead, frontal bone extending through into frontal sinus, and upper and lower eyelids of both eyes. Radium only method that could give any hope of relief in this type of case.

FIG. 15B. Result of radium needle treatment. Patient lived for three and one-half years and finally died from extension of disease to brain.

FIG. 16A. Cavernous angioma of scalp, both upper and lower eyelid, and nose. Voluntary opening of eye was impossible. This is a type in which radium treatment is best. Lesion was considerably worse than appears in photograph.

FIG. 16B. Result of radium treatment. Note that angioma is flattened to skin level and that eye is open. Result much better than appears in photograph. (Small angiomas not involving important structures may be treated by desiccation with good cosmetic results.)

FIG. 17A. Mixed cell sarcoma, springing from ethmoid, filling orbit and causing great bulging of eyeball.

FIG. 17B. Result of combined coagulation and radium treatment. No recurrence in seven years. (Coagulation is an excellent method for exenterating orbit.)

FIG. 18A. Squamous cell epithelioma, grade 3, of orbit, ethmoid, and frontal and maxillary sinuses. (These advanced cases are still frequently seen, regardless of campaign of education for early recognition now carried on.)

FIG. 18B. Result of one desiccation operation. No such result could be obtained with any other form of treatment. Patient died of complications about a year afterward but not of the disease. Artificial features by sculpture method could easily be accomplished in this type of case.

PLATE IV

PLATE V

FIG. 19A. Congenital cavernous angioma of orbit.

FIG. 19B. Complete exenteration of orbit by coagulation. Lids were divided and dissected back so as not to be injured by current.

FIG. 19C. Lids after suturing before patient came out of ether.

FIG. 19D. Ultimate result, with conservation of eyelids. An artificial eye is contemplated.

FIG. 20A. Squamous cell epithelioma, grade 3, of ear and mastoid region.

FIG. 20B. Result of combined coagulation and radium treatment. No recurrence in ten years.

FIG. 21A. Squamous cell epithelioma of parotid gland, jaw and ear, with infiltration into neck.

FIG. 21B. Result of combined coagulation, radium treatment and resection of bone. Patient is living and still without recurrence five years after treatment. (The parotid gland cases are difficult of management and uncertain of results.)

FIG. 22. Example of advanced squamous cell epithelioma, grade 4, in which type it is necessary to ligate the common carotid artery low down before proceeding with coagulation. Radium should also be employed since it is difficult to destroy all of disease by coagulation. (Fifteen common carotid ligations were accomplished during the past two years in the Clark Hospital without a single case developing hemiplegia.)

FIG. 23. Example of squamous cell epithelioma, grade 2, of lower lip and chin with considerable involvement of bone on both sides of median line. Complete surgical resection of mid-portion of mandible results in loss of support to floor of mouth, with consequent protrusion of tongue, a very unpleasant sequel. Coagulation may be employed successfully in most of these cases since only diseased portion of bone is destroyed, with later sequestration, thereby conserving integrity of floor of mouth.

FIG. 24. Example of leukoplakia lingualis. Desiccation is the treatment par excellence in this type of lesion as well as in leukoplakia on mucous membrane surfaces wherever located.

FIG. 25. Example of result obtained in a squamous cell epithelioma, grade 3, extensively involving cheek all the way through into mouth, alveolus back to joint, floor of mouth, and tongue, with quite extensive metastasis to cervical glands. Coagulation was employed and all malignant tissue and bone destroyed, followed by resection of lower jaw almost from median line to articulation. Radium was used successfully to control metastasis. After a year's freedom from recurrence, a plastic operation was performed, taking a flap from chest. This patient has been well for nine years.

FIG. 26. Example of adamantinoma which is usually associated with bone cysts. Good results are obtained by coagulation and instrumental removal of diseased bone.

FIG. 27. Example of epulis. Desiccation has been so successful in a great number of these cases in permanently curing these lesions and at same time conserving bone and teeth that it is considered by me to be a specific.

PLATE V

vitality of the surrounding normal tissue to a certain extent. In case of recurrence, little more can be hoped for from further irradiation, owing to the resulting fibrous changes. This is a fact well known to radiologists. Because of these resulting changes, irradiation should not be used routinely in conjunction with electrothermic methods in *distinctly localized benign or malignant lesions* within the mouth, except in very malignant squamous cell lesions, when it should be considered to take care of possible outlying malignant cells, since there is greater likelihood of recurrence in this type of lesion. Recurrences, however, are not always due to incomplete work, but to new lesions developing in favorable soil.

There are many cases in which the electrothermic methods are not applicable, and in which irradiation is preferable, but my experience has been such that I feel very strongly that the electrothermic methods alone with the exceptions noted should be used in the type of lesion mentioned, namely, primary localized lesions.

Electrothermic methods are strongly contraindicated in extensive lesions that cannot all be destroyed with one operation. If any of the disease is left, it will usually be stimulated to greater activity. If vital structures are involved, irradiation is preferred to electrothermic methods.

It is quite necessary to treat the lymphatic drainage areas in the neck by radium, roentgen ray, or, in some instances, a combination of both, to inhibit or destroy malignant cells migrating to the glands, or to destroy the pathologic element, if metastasis is already apparent.

Apparatus and Operator. High frequency machines, as devised by different manufacturers, vary greatly in construction; hence, there is a corresponding variation in the quality of the currents produced. The thermic intensity is often too great or too little, and an undesirable faradic effect, producing shock and contraction of the tissues, is to be expected when the improperly constructed machines are used. This lack of standardization is unfortunate, since to produce the desiccation effect under the best conditions, an accurate balance must be maintained between voltage and amperage, and also between capacity, inductance and resistance. Thus, different operators, employing various types of apparatus, may obtain different results.

A machine giving a satisfactory therapeutic current may not be suitable for surgical work. I have found it necessary to have machines constructed according to definite specifications in order to obtain the various features necessary for my particular requirements. Even with a machine constructed on correct lines, there is difficulty of application, principally in the acquirement of a proper technique.

Much harm can be done by an operator without practical knowledge of the various factors involved. This warning seems appropriate since a considerable number of cases have come under my observation that were improperly treated with high frequency currents.

Electrothermic methods can be best practiced only by those who have had surgical training and experience. They are quite as surgical in practical application as operative surgery, requiring the same knowledge of anatomic landmarks and the same surgical judgment that every good operator must have.

Indications. Electrothermic methods are peculiarly adapted to treatment of localized malignant growths occurring in any part of the oral cavity and adjacent parts, such as the lip, jaw, nose, throat, sinuses, eye, orbit, parotid gland, ear, etc. The efficiency of these methods is, in certain cases, increased by the combination of operative surgery, radium and roentgen rays.

Electrothermic methods should be used alone only in localized tumors of a type that does not tend to metastasize. The basal cell type of epithelioma occurring on cutaneous surfaces, such as the face and eyelids, even though extensive and with involvement of bone, may be so effectively treated by the desiccation or the coagulation method that recurrences are infrequent.

In localized squamous cell epitheliomas on cutaneous surfaces or mucuous membranes, the results are almost as good as in the basal cell type, depending to a great extent upon the grade, or in other words, upon the degree of differentiation of the cells, from the embryonic to the adult cell. *When the growth is no longer localized and metastasis has occurred, it is again emphasized that other methods must be used in addition.* The choice between local or general anesthesia is governed by the same principles as in operative surgery.

Technique. There are many variations in technique to meet different indications, but as an example of standardized technique, the operation of amputation of the tongue by the coagulation method is here described.

AMPUTATION OF THE TONGUE

If the case is far advanced, with considerable general emaciation, it is my practice to perform a preliminary gastrostomy. This also applies to extensive lesions, located anywhere in the mouth or throat, that render deglutition difficult. The operation of gastrostomy may be performed under local anesthesia, with little hazard or inconvenience to the patient. This procedure has several advantages in permitting the building up of the patient's strength, relieving the pain incident to swallowing, and frequently resulting in a considerable reduction of swelling and induration in the tongue and throat following the rest given to these parts.

The tongue can be coagulated readily through its base and then excised, with infrequent secondary hemorrhage; but to obviate this danger completely, it is considered safer to ligate the lingual arteries as a preliminary measure, or for still greater safety, one or both of the external carotid arteries.

Ether anesthesia is employed by preference. The ether should be removed from the room when the patient is fully under its influence and before the current is applied, else it might ignite. Should the operation be unusually prolonged and the patient show signs of regaining consciousness, the operation may be temporarily discontinued as often as required and ether again administered. Ordinarily this operation is of such short duration that the use of ether a second time is not necessary. Scopolamine, 0.01 grain (0.6 mg.) and morphine, ¼ grain (16 mg.) may, in some instances, be used hypodermically one hour before the administration of ether. Less ether will be necessary under such conditions, and the immediate postoperative discomfort will be minimized.

After the jaws have been separated with a mouth gag, a heavy silk suture is passed from side to side through the tip of the tongue, by means of which it is drawn well forward. The coagulation needle is then brought in contact with the anterior surface of the tongue as far back as is necessary, even to the level of the epiglottis, and the current is turned on, either by the operator by means of a foot control, or by an assistant on signal. The needle is then moved across the tongue and carefully inserted into it at different points, coagulation being allowed to take place as it moves. After this has been thoroughly accomplished, the tip of the tongue is elevated by means of the suture, and a straight, sharp sewing needle, of proper length, is substituted for the curved knitting needle previously used. The frenum is then coagulated, and the needle inserted between the tongue and the floor of the mouth. When coagulation is again completed, curved scissors may be used to cut through the coagulated areas on both surfaces, and the tongue is then separated from its attachments.

The after-treatment consists of the use of a simple antiseptic mouth wash, the application two or three times daily of a weak solution of sodium hypochlorite, which sterilizes, or at least minimizes bacterial invasion, deodorizes and tends to keep the slough firm and free from maceration.

Care should be taken not to remove the slough prematurely, else secondary hemorrhage may occur. Usually organization

takes place in the vessels before the time for the separation of the slough.

When a preliminary ligation of the linguals or carotids has been performed, hemorrhage is, of course, not so much to be feared.

Such a major electrothermic operation should be performed in a well-appointed operating room, the same preparatory technique being used as in any surgical operation, although perfect sterilization is obviously not so important as in a cutting operation.

OTHER ADVANTAGES AND INDICATIONS

In addition to the desiccation or coagulation of the affected tissues and the sealing of blood and lymph channels, the heat penetrates beyond the area actually destroyed and devitalizes malignant cells, without permanently impairing the healthy tissue, thus lessening the likelihood of local recurrence or metastasis and conserving the maximum amount of normal tissue. The relief from pain and comparative freedom from postoperative discomfort are worthy of note. This is probably explained by the destruction of the sensitive nerve endings.

The desiccation and coagulation methods are certainly superior for general use to the so-called "radio knife," or high frequency cutting current, the heat from which does not penetrate the tissues far beyond the point of contact. The latter method has, however, a definite field of usefulness, but this will not be discussed here.

Malignant cells, especially those that are least differentiated, are more vulnerable to heat and are devitalized at a lower degree of heat than are normal cells. The thermic sensitiveness to the action of the high frequency current has often been observed clinically and demonstrated histologically.

The practice of intentionally treating a malignant lesion by a series of desiccation or coagulation operations is reprehensible and must be discouraged, unless, through error in judgment or for some other reason, an incomplete operation is performed the first time, and a second becomes necessary to complete the work. It is quite as irrational to do this intentionally as to expect success by excising a cancerous growth surgically in a series of operations. Therefore, it should be the aim to complete the work with one operation if possible.

Desiccation is a most satisfactory method of treatment of infected tonsils, especially in adults, if the operation is correctly performed. If the technique is not good, poor results will be obtained. This method has been disapproved by some operators, but examination of their technique has revealed the cause of their failure. If properly done, the method will bear the most critical examination. This statement is made after thoughtful consideration of facts, based upon twenty years of observation and experience with the desiccation method in tonsil work.

Neoplasms of the oral cavity possess, in general, the same characteristics and manifest the same behavior as tumors arising elsewhere. The relative degree of their benign or malignant nature is influenced to a considerable extent by the anatomic and functional properties of the structures involved. For a better interpretation of the nature of neoplasms in general, and those of the oral cavity in particular, one must take into account not only the clinical and histologic data, but also the biologic elements concerned in the development and growth of the tumor.

HISTOLOGIC CONSIDERATIONS

Our knowledge of neoplasms is meager at best. What little knowledge we have is frequently thrown into confusion because of our failure to visualize the problem as a whole, and to link the clinical and histologic evidences with the biologic factors. From the clinical aspect, the line of demarcation between benign and malignant tumors appears well defined and rests upon the basis of special characterization common to both. Viewed biologically, the line of demarcation, while still evident, becomes less distinct. To the histologist, all neoplasms represent a func-

tionless mass of proliferated cells. From the biologic point of view, all neoplasms are malignant in that they are parasites and live at the expense of the host. Thus, the border line between benign and malignant neoplasms becomes more distinct, or less distinct, or entirely obscured, according to the particular point of view of the observer.

Clinically, we look upon malignant disease as distinct and apart from all other diseases. Histologically, neoplasms possess certain things in common, resembling acute and chronic inflammatory tumors, in that they represent an aggregation of proliferated cells, but differing in the type of cell composing the tumor: the polymorphonuclear in acute inflammatory tumors, the lymphocyte, or fibroblast, in the subacute or chronic inflammatory tumors. Biologically interpreted, neoplasms are found to have a property possessed by other diseases, which is based upon an inherent attribute common to all living cells, namely, reaction to irritation. The manifestation of this reaction is cell proliferation and multiplication. Whether the proliferated element is a polymorphonuclear, fibroblastic, endothelial, or neoplastic cell is, in great measure, determined by the type and intensity of the irritant.

The cause of neoplasms, whatever it may be, appears to be activated by a common factor, chronic irritation. In no other part of the body can one trace such close relationship between persistent irritation and development of malignant growths as in the oral cavity. The mouth and its structural contents, because of their peculiar anatomy and function, are frequently subject to minor trauma. A jagged tooth, ill-fitting denture, loose bridges, irritating material, such as tobacco, etc., act as irritants and are apt to initiate a chronic inflammatory process. The inflammatory reaction persists because healing is prevented by several agencies present in this particular location, such as the frequent passage of food, the general motility of tongue and buccal surfaces, and the presence of bacteria whose activities are enhanced by the already devitalized area and the moisture and temperature of the mouth. A vicious circle is thus established.

To exemplify: A chronic inflammation of the tongue is induced by any of the above-mentioned irritants, resulting in a chronic glossitis. The inflammation persists not only because of the particular irritant giving rise to it, but also because of the location of the lesion in this particular structural and functional environment. A chronic glossitis is established, with the formation of fissures in the inflamed area that refuse to heal. The surface epithelium in the affected zone eventually responds to this persistent irritation in the form of proliferation and multiplication of its cells, leading to an overgrowth of the surface epithelium, manifested clinically as raised white patches (leukoplakia). With the continuation of this vicious circle, the hyperplastic epithelium sooner or later assumes greater activities and the simple overgrowth of the surface epithelium advances. Thus, leukoplakia may be looked upon as the precursor of lingual carcinoma.

Again, carious teeth frequently lead to multiplication of the paradental epithelium. The hyperplastic cells, like those of the surface epithelium of the tongue, may eventually assume neoplastic activities, giving rise to an adamantinoma of the maxilla.

As stated above, the behavior of benign and malignant tumors is influenced by the anatomy and function of the structures involved. This applies particularly to the mouth. Thus, a papilloma of the tongue, buccal surface, etc., is more likely to undergo malignant changes than papilloma elsewhere. Carcinoma of the tongue, buccal surface, alveolus or floor of the mouth is, as a rule, very destructive and metastasis is more rapid and earlier than in other locations. The tongue is supplied by a double lymphatic system, one branch draining the submucosa and the other the muscularis. These practically envelop the whole organ from base to tip, and after pursuing an irregular course, send their tributaries to the submental, submaxillary

and deep and superficial cervical lymph nodes. The lower deep cervical lymph nodes are located on the jugular vein, the upper deep cervical near the common carotid just above the point of bifurcation. The rich lymphatic network, therefore, offers many avenues for the travel of the various cancer cells to the neighboring lymph nodes. The location of the lymph nodes and their relation to vital structures influence, in a great measure, the clinical course of malignant disease of the mouth.

While squamous cell carcinoma is the growth most frequently encountered, one not infrequently meets with other types in the oral cavity, such as sarcoma, adamantinoma, epulis, papilloma, hemangioma and lymphangioma. Epulis, adamantinoma and papilloma, though classed with benign tumors, may assume active growth and pursue a malignant course.

The grading of tumors gives some indication as to prognosis and has an influence on the choice of treatment. Statistics relative to results obtained by various methods, unless based upon grading according to the degree of cell differentiation, are of comparatively little value. Therefore statistics based upon a general diagnosis, such as "malignant" or "squamous cell epithelioma," are misleading.

Since the actual etiologic factor regarding cancer is still unknown, no specific having yet been discovered, we must use such methods as have proved to be of value in combating this disease. They include, as stated before, operative surgery, the roentgen ray, radium and electrothermic methods (desiccation and coagulation). While surgery plays an important rôle, its usefulness has, in many cases, been enhanced by the employment of roentgen rays or radium as preoperative and postoperative adjuncts. In certain instances, roentgen rays and radium, either singly or in conjunction, have entirely replaced operative surgery. Like surgery, desiccation and coagulation remove the tumor growth, but, unlike surgery, they do not act as a mere physical agent removing the growth *en masse*, but destroy the neoplastic cells in situ to some depth beyond the growth.

In the removal of a neoplasm, while the chief object is the destruction of the malignant cells, a secondary important factor is the maintenance and preservation of the vitality of the adjoining healthy tissue, and that is influenced, in a large measure, if not altogether, by the associated degeneration and fibrosis. The observation that the resulting scar in the case of electrodesiccation and coagulation is soft and not so extensive as that resulting from the use of some other methods may not only be confirmed clinically but also explained histologically.

The electrothermic methods are governed by certain fundamental principles. They are dependent for their results on the resistance of the tissue to the current, which manifests itself in the formation of heat. The high frequency current used in desiccation is of a relatively low amperage, producing only a moderate degree of heat, but of sufficient intensity to cause complete evaporation of the fluid content of the cell. The coagulation current is, on the other hand, of comparatively high amperage and low voltage, and induces such intense heat that the cells are not only dehydrated but their protoplasm is coagulated as well.

Histologic Studies Concerning Electrodesiccation and Electrocoagulation. The microscopic picture of neoplastic tissue submitted to desiccation presents typical characteristics. While the cells still retain their outline, they appear shrunken, elongated and dried up. Evidence of such degenerative changes as hydropic or fatty degeneration are not discernible. The blood vessels in the immediate and adjacent vicinity of the field of operation are thrombosed.

In tissues subjected to coagulation, there is complete loss of cell outline. The neoplastic cell elements seem to have fused into a structureless, homogeneous mass, a hyalinized appearance resulting. The blood vessels and lymph channels are thrombosed. The secondary and associated

changes in all such lesions are degeneration and fibrosis. Whether the fibrous connective tissue shall be abundant and dense, or less abundant and soft, is influenced by the amount and nature of the accompanying degenerative and necrotic material, which, in turn, are determined by the particular type of irritant. Thus, after desiccation, the fibrosis is slight and the resulting scar is soft and pliable. Following coagulation, the fibrosis will be more or less abundant, this depending on the intensity of the heat generated and the consequent degree of frame destruction. The size of the subsequent slough or sequestrum, where bone is involved, is, therefore, largely under the control of the operator. (See Figs. 1 and 2). (From the Clark Hospital Laboratory.)

SUMMARY AND FINAL REMARKS

Twenty years of intensive study and experience have demonstrated to me that malignant disease within the mouth and adjacent parts, while always a most serious affection, is not necessarily hopeless, since many brilliant results are obtained by the judicious employment of combined methods, of which electrodesiccation and electrocoagulation are most important, indeed, are, on pure merit, entitled to hold first place in treatment of primary lesions.

Operative surgery is also considered indispensable, and is constantly employed by me to ligate blood vessels and to resect bone. In certain instances cervical lymph nodes are surgically resected, but never before the malignant element has been inhibited, or, when possible, entirely destroyed by pre-operative irradiation treatment. A gastrostomy is often performed to insure proper feeding in undernourished patients, owing to difficulty in deglutition before the operation and during the convalescent period. Many radical electrothermic operations have been rendered possible by this preliminary gastrostomy. Operative surgery has a still greater field of usefulness in cancer involving other parts of the body, which will be discussed in another paper.

Radium and roentgen rays are used in my practice in connection with neoplasms in the locations under consideration principally to control metastasis to the cervical lymph nodes, and their value for this purpose has been definitely established.

The primary lesions are, with certain exceptions (cases in which vital structures or those very important to conserve are involved) best treated by the electrothermic methods, and I have had no cause to regret this practice after critical comparison of results of different methods in many cases.

The histology of malignant lesions within the mouth and elsewhere is often a determining factor in prognosis, and also a guide to treatment, since embryonic, fully differentiated and intermediate cells require different treatment, especially in relation to irradiation; for example, squamous cell epithelioma, grade 4, which cells are undifferentiated, though most malignant, respond more readily to the roentgen ray and radium treatment than grades 3, 2, or 1, which are in different stages of differentiation. This is explained by the slight resistance to these treatments by the embryonic cells and the greater resistance as the cells approach the adult grade. Many pathologists do not yet appreciate the significance of this differentiation, nor do they recognize the different grades under the microscope. A check of many cases in which histologic studies have been made during the past twenty years has demonstrated to me beyond a doubt that it is important to know definitely the grade of the tumor and that there are certain characteristics of staining that positively identify the grades.

Finally, permit me to state with assurance that electrodesiccation and electrocoagulation employed in their proper place are the most important measures for the successful treatment of primary neoplastic and allied lesions in the mouth and adjacent parts, though operative surgery, roentgen ray and radium are also valuable as described, in their respective rôles, each complementing the other.

THE BALDWIN OPERATION FOR APLASIA OF VAGINA*

WITH REPORT OF ONE CASE

C. JEFF MILLER, M.D., F.A.C.S.

NEW ORLEANS

THE mechanism of vaginal aplasia is quite clear, even though its etiology is not yet understood, beyond the fact that, like all developmental errors, it is due to some arrest or perversion of growth caused by disturbed nutritional balance or by actual disease in either the mother or the fetus. The tubes, the uterus and the vagina, it will be recalled, arise from Müller's ducts. These ducts, which at first extend as separate, solid, unfused structures to the urogenital sinus, by the ninth week of intrauterine life become merged in the lower half into one structure, and by the end of the fifth month are completely differentiated into tubes, uterus and vagina. Errors in fusion of the lower part of this embryonic structure give rise to anatomic defects in the organs which develop from it, and, because of the sameness of origin, defects of the vagina are frequently associated with defects of the uterus and tubes also.

The ovaries, on the other hand, usually do not share in the anomaly. They arise from different embryonic tissue, the Wolffian bodies, and, since they determine the sex of the organism, defects in their development give rise to the condition known as hermaphroditism or bisexualism. A woman who exhibits an absence of the vagina usually has well developed feminine characteristics because her ovaries are usually not involved in the malformation. She possesses a female psyche but her normal female functions of menstruation, coition and child-bearing cannot be performed because a part of the essential mechanism is lacking, and the expression of her sex, if we may so term it, is forever denied to her.

For more than a century efforts have been made to aid this unfortunate group of women by surgical means. The first attempts were little more than the creation of an opening in the cellular tissue of the rectovesical space, the canal being maintained by the wearing of some form of tampon or plug. When this method failed, as was to be expected, the newly created passage was lined with transplants, chiefly from the thighs or the vulva, or, as in the Graves operation, from both. The most recent modification of this type of operation is that devised by Frank and Geist, which is an adaptation of the Gillies tube-flap method of facial surgery. The flap is taken, as usual, from the thigh, but the operation is performed in stages, to secure perfect vascularization of the transplant, and the canal is eventually lined with a graft whose nutrition is assured.

Successes have been reported with each of these methods, but it cannot be expected, because of the structure of the lining tissues, that the results should be uniform or even permanent. It has been repeatedly pointed out, in this connection as in others, that while mucous membrane makes a very fair substitute for skin, the converse of the proposition is by no means true. Any skin transplant to the vaginal canal has a tendency towards contraction and atrophy, and for that reason this canal, which is essentially a collapsible tube whose walls are in contact the greater part of the time, must be lined with mucous membrane, whose tendencies are diametrically opposite.

Mackenrodt achieved this result by lining the surface of his newly made vaginal canal with mucous membrane

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taken from another patient operated upon at the same clinic and at the same time, but his performance is little more than a tour de force. Such a source of supply is obviously limited, quite aside from the other very apparent disadvantages of the procedure.

The two most practical methods yet suggested are those of Schubert (really Popov) and of Baldwin, each of which utilizes some portion of the intestinal canal for the formation of the new vagina. Schubert contends that the proximity and anatomic structure of the rectum, which is that of a deferent organ, make it peculiarly suitable for the new purposes to which it is to be put. The lower four inches are utilized, and a sort of blind cul-de-sac is created, which is attached as high as possible to the sacrospinal ligament; removal of the coccyx is a necessary preliminary. The immediate danger to life is supposed to be relatively small. Schubert himself reported 95 collected cases with a mortality of 3.2 per cent, although Judin, I believe more correctly, quotes a mortality of 10.3 per cent in 68 cases collected by Rabinowitch and brought up to date by himself. How many of Schubert's cases, if any, are included in this group I cannot say. The operation is certainly technically very difficult, and the end results, in spite of functional successes, are not always happy, for fistulae are quite frequent and actual incontinence of feces is not unusual.

Baldwin in 1904 suggested the utilization of a section of the ileum, having devised the technique for a patient who had consulted him for a complete acquired atresia, the result of a sloughing of the entire vagina and cervix after craniotomy. The patient, however, refused the abdominal procedure and the author had no opportunity to try out the method until 1907. At that time it was employed with complete success in a similar case in which almost complete vaginal atresia had followed a difficult forceps delivery. Mori of Tokio performed the operation in 1908 and is frequently stated to have been the first to do it, but as Baldwin's case was reported in the *American Journal of Obstetrics* for November, 1907, there seems no question as to his priority both in suggestion and in performance.

The technique of the Baldwin operation is so well known that only the merest outline is necessary. Briefly, it consists of the following steps:

1. The formation of a vaginal canal by dissection of the rectovesical space to the level of the peritoneum.

2. Laparotomy, isolation of the most dependent loop of ileum, pursestringing of the four severed ends, lateral anastomosis of the main bowel.

3. Incision of the cul-de-sac and transplantation of the isolated loop of ileum (doubled) into the vaginal space by the aid of gentle traction from below.

4. Suture of the pursestringed ends of the isolated segment at the peritoneal level of the vaginal canal, followed by the usual abdominal closure.

5. Opening of the bowel from below, thorough cleansing, packing of each segment loosely with iodoform gauze, stitching of the circumference to the perineal opening.

6. Repeated postoperative packing at regular intervals, crushing of the bowel septum between clamps at the end of three weeks or longer, dilatation of the new vagina as indicated.

In spite of numerous suggestions, the author has never seen cause to modify his original technique. He has stated from the beginning that if the ileum, for anatomic reasons, cannot be employed the sigmoid colon may take its place. He insists that the doubled loop of bowel should be used, since a single section makes the vagina too small for practical purposes. He stresses the importance of careful dissection between the rectum and bladder, so as to avoid puncturing either organ, and it is easy to see that if the anatomy is at all confused it might be well to insert guiding instruments into both.

Before Baldwin published his technique

he observed many hundreds of patients at laparotomy, and in no single instance did he find that the amount of available slack in the ileum or the sigmoid flexure of the colon would have prevented the performance of the operation. My own experience in abdominal surgery leads me to believe that he is entirely correct in his assumptions, and for that reason I can see little point to the various modifications which have been proposed. Constantini, to mention a specific instance, has devised a technique whereby sectioning of the mesentery is avoided, a procedure which he considers adds materially to the dangers of gangrene. He places his clamps on the intestine in such a manner as not to include the mesentery, which, after the usual pursestringing of the ends and lateral anastomosis of the bowel, is rolled up intact behind the sutured section. His experience with this maneuver on 18 cadavers and 2 living patients leads him to believe that section of the mesentery is needless, since sufficient mobilization of the isolated coil can be secured without it. In most cases perhaps it can be, but it is easy to conceive that where one is dealing with a mesentery which is short, or fat, or both, this technique would result in dangerous tension on the sutured bowel, and so would defeat the very purpose for which the author devised it.

Baldwin has always emphasized the importance of preserving the mesenteric circulation, and I think Judin's technique is preferable to Constantini's. He points out that in choosing the loop to be isolated, whenever possible one should be selected whose mesentery contains feeding vessels which are small and which lead to the free edges. After suture to the vulval opening, these free edges undergo less strain than does the middle portion of the mesentery, and the circulation is less impaired than it would be if the large nutritive vessels were located in the center.

The operation is not always free from technical difficulties. In one of Baldwin's own cases, for instance, previous attempts to establish a vagina had resulted in so much scar tissue below that the rectovesical dissection was extremely difficult, while in the same case either the previous removal of both ovaries (for excessive symptoms of the molimen) or an inflammation of the appendix had resulted in so many adhesions that the situation above was equally complicated. Moreover, like every other abdominal operation, this one has its sequelae. The narrowed lumen of the bowel and the development of postoperative adhesions make intestinal obstruction always a possibility in the future, and cases have been reported in which it actually occurred. Baldwin describes a case, not one of his own series, in which, at the end of an apparently perfect convalescence, the transplanted bowel suddenly appeared on the dressings, either because the mesenteric circulation was defective in the loop selected or because the blood supply was cut off by too snug a closure of the peritoneum about it. Somewhat similar is a case of Peterson's, in which, several years after an operation entirely successful except for an excessive secretion of mucus, the bowel prolapsed to such an extent that it had to be anchored to the infantile broad ligaments.

Postoperative vaginal pain has been observed in several cases, though I personally have not witnessed it. In one of Judin's own cases it was so extreme that during the giving of a douche the nozzle was firmly gripped by the wall of the new vagina, supposedly as the result of excessive intestinal peristalsis. One wonders whether, in this instance at least, some involvement of the muscles of the pelvic floor was not partially responsible.

One of the chief disadvantages of the Baldwin operation, and one which is said to be almost entirely lacking in the Schubert technique, is the excessive secretion from the bowel wall. Baldwin states that this occurs only when too long a loop has been used, but I cannot follow his argument; such a secretion is a normal function

of intestinal mucosa, and I cannot see how the length of the loop can influence it. Judin quotes Stoeckel to the effect that the discharge is more likely to be annoying when albugineous food is eaten than when fats are taken in quantity, but regulation of the diet in this regard is plainly impractical. One or two writers have suggested an explanation which may be correct, that the discharge in itself is really a rather slight affair, and is simply a source of annoyance to women who, because of their anatomic defects, have never before felt the sensation of any sort of vaginal discharge, menstrual or otherwise. I think it is generally agreed that if the discharge is present, it tends to decrease in time.

Judin and Daniel both advocate the use of spinal anesthesia on the ground of the excessive length of the operation, which they set at two hours or more. Unless unforeseen obstacles are present I cannot see why it should last so long. In one of my own cases the procedure lasted just over an hour, and in the other it took only forty minutes.

These points, however, are minor considerations. The chief consideration is that this is unquestionably an operation which endangers life. It is true that in contrast to the usual intestinal operation, which is undertaken for grave pathology, this is undertaken, presumably, on persons in excellent condition. It is likewise true that careful asepsis will for the most part eliminate infection, the most dreaded of all complications. But the matter cannot be dismissed so lightly. Even when performed with every circumstance favorable, intestinal surgery carries with it an inevitable mortality, which is variously set at from 2 to 10 per cent. The latter figure may be too high, but the former is certainly too low. Baldwin himself has done this operation twenty times with only one death, a mortality of 5 per cent, and he believes that this death would have been prevented had not the patient and her husband, both ignorant foreigners, refused to permit any postoperative treatment at all. So far as I know, no attempt has been made to collect the American cases, but the mortality of Continental surgeons is quite high. Thus Daniel quotes 79 cases with a total mortality of 14, 17.5 per cent. Judin quotes 106 cases collected by Rabinowitch (whether or not Daniel's cases are included I cannot say) with a mortality of 15, 14.1 per cent. To these he adds 16 others, 6 of them done personally, with 2 additional deaths, giving a total mortality of 13.38 per cent.

Baldwin claims that this death rate is entirely unnecessary, and that when it does occur, it is due either to a departure from the original technique or to the performance of the operation by unskilled surgeons. I agree with him to a certain extent in both of these claims, but it must not be forgotten, as I have already pointed out, that any intestinal surgery presupposes an inevitable minimum mortality, and that all operations, regardless of their gravity, will at some time or other be performed by men who are not qualified to do them.

In spite of these objections, I think there is little doubt that the Baldwin technique is the operation of choice in those instances of absent vagina in which operation is indicated at all. The question, therefore, is when is operation indicated? From a purely surgical standpoint, absence of the vagina, whether congenital, or, as in Baldwin's first 2 cases, acquired, would seem a definite indication for the performance of some sort of surgery, but from the ethical side the decision is not so clear-cut. In both the Baldwin and the Schubert operation the results are, generally speaking, good, in that the artificial vagina acts quite satisfactorily as an organ of coition. That pregnancy and labor are also possible if the remainder of the sexual apparatus is intact is proved by the case reported by Wagner of Prague, in which during 3 deliveries a vagina constructed by the Schubert method stood the test of parturition. But in the average case the other sexual organs are either absent or underdeveloped, and, even granting that many women with a normal sexual apparatus

suffer from dyspareunia and that many others, equally fully equipped, never conceive, even granting this, the question arises whether we have the ethical and moral right to ask a woman to risk her life in order to gratify what, under the circumstances, can be nothing more than a purely physical desire.

Certainly there is no indication for operation in a young woman who does not contemplate marriage unless, as in Wright's case, the knowledge of the defect is exerting a deleterious nervous and mental effect. How much of the trouble was due, in this special instance, to an excess of ovarian activity it is not possible to say, but the good results of oophorectomy seem to prove that it played a large part. Operation is certainly indicated in such a case as that reported by Baldwin (the first in which he performed the operation) in which a normal, functioning uterus demanded some channel for the exit of the menstrual blood, and in which the alternative would have been hysterectomy. Probably operation is indicated in a young woman about to be married, or in a woman married without knowledge of her defect. Many such instances are reported in which the patient has threatened suicide if she were not aided, or in which a marriage would have been annulled and a home destroyed unless some intervention were done.

Even with this "social" indication granted, there is nothing to be said for the performance of the operation unless the patient is fully aware, and unless her husband, if he exists, is fully aware, of what it entails. If the risk is clearly understood, and if the woman's social circumstances are such that she is ready to assume it, then and then only is the conscientious surgeon justified in making the attempt to repair nature's error. In short, this is an operation which, despite its ingenuity, should never be undertaken "lightly or unadvisedly," but only when one is honestly convinced that the circumstances of the special case justify the dangers inherent in its performance.

The first case in which I used the Baldwin technique was reported in the *American Journal of Obstetrics and Gynecology* for September, 1924. The patient, then a young women of nineteen, was operated on at Charity Hospital in 1921, just prior to her marriage, and examination at repeated intervals since has shown a perfect and permanent result. Inspection through the ordinary bivalve speculum gives no hint that one is not viewing a normal vagina, and her husband has no idea that she is in any way defective. In this instance both uterus and tubes were rudimentary, so that only vaginal function could be hoped for. The ovaries were about a sixth of their normal size and there was no evidence of corpus luteum formation, though an interesting feature of the history is that, as a girl of fourteen, for a period of several months this patient had attacks of severe abdominal pain associated with engorgement of the breasts, and, as she looks back on them, probably coincident with a normal menstrual cycle.

The case which I am now reporting presents several interesting features. I first saw the patient on May 23, 1928, several days after her marriage, the consultation being sought because marital relations had proved impossible. Local examination disclosed the labia majora poorly developed and the labia minora practically absent. The only evidence of a vagina was a small sinus in the perineal mass, which admitted a probe for perhaps half an inch. Rectal examination was unsatisfactory. Except for this local defect the patient showed no abnormalities of development.

She was at this time thirty-one years of age, and, although the daughter of a physician, she seems to have entered upon her marriage entirely unaware that the absence of menstruation throughout her life denoted any physical defect. Her early history was without incident except for a story of a left inguinal hernia since childhood, which, four years previous to this time, had enlarged to such an extent that

operation was necessary. Permission to investigate the previous record was secured, but, most unfortunately, details were entirely lacking. It was merely stated that left inguinal herniotomy had been done, and that the sac contained the left tube and ovary. There was no mention of their state of development, nor was there any mention of the vaginal defect or of the absence of menstruation.

On May 28, 1928, under ether anesthesia, a typical Baldwin operation was done without difficulty. At laparotomy the ovaries were found to be of normal size and considerably scarred, showing that the changes incident to ovulation were occurring, although the patient, when questioned later, denied any symptoms suggestive of the molimen. Behind the upper rectum, in the mesentery of the lower cecum, was a mass resembling a kidney in contour but rather larger. Whether this was the left kidney, which was missing, or the uterus, which also could not be located, it is not possible to say; my impression is that it was a kidney, but the investigation was not continued, since it would have served no useful purpose and would merely have prolonged the operation. The tubes were poorly developed and no ligaments were identified. The right urinary apparatus seemed entirely normal.

The patient's convalescence was most gratifying from the surgical standpoint, although it was complicated by a severe cystitis, probably due to the prolonged use of the catheter. Six weeks after operation the bowel septum was clipped, anesthesia being necessary because of the patient's absolute lack of cooperation when the procedure was attempted at the office. I have advised dilatation, which she has refused, but to date the functional result seems excellent, and the discharge is not profuse enough to be complained of even by such a frankly neurotic woman as this patient is.

BIBLIOGRAPHY

Baldwin, J. F. The formation of an artificial vagina by intestinal transplantation. *Ann. Surg.*, 40: 398–403, 1904.

Idem. The formation of an artificial vagina by intestinal transplantation. *Am. J. Obst.*, 56: 636–640, 1907.

Idem. Artificial vagina by intestinal transplantation. *Med. Rec.*, 82: 1170, 1912.

Idem. Artificial vagina: the Baldwin operation. *Surg., Gynec. & Obst.*, 42: 152, 1926.

Idem. The Baldwin operation for the formation of an artificial vagina. *Surg., Gynec. & Obst.*, 45: 569–570, 1927.

Constantini, M. Upon a point of operative technique in the Baldwin operation. *Presse méd.*, 32: 798, 1924.

Daniel, C. Contribution à la création d'un vagin par transplantation intestinale (avec 13 observations roumaines). *Rev. franç. de gynéc. et Obstet.*, 19: 305–321, 1924.

Davis, C. H. and Cron, R. S. Congenital absence of the vagina. *Am. J. Obst. & Gynec.*, 15: 196–201, 1928.

Deavor, T. L. Artificial vagina, its construction. *Internat. J. Surg.*, 32: 33–39, 1919.

Frank, R. T. and Geist, S. H. The formation of an artificial vagina by a new plastic technique. *Am. J. Obst. & Gynec.* 14: 712–718, 1927.

Judin, S. The Baldwin operation for the formation of an artificial vagina. *Surg., Gynec. & Obst.*, 44: 530–539, 1927.

Miller, C. J. The formation of an artificial vagina. *Am. J. Obst. & Gynec.*, 8: 333–334, 1924.

Schubert, G. The author's method of forming an artificial vagina. Conception and delivery through such a vagina. *Med. Klin.*, 28: 1334–1336, 1927.

Tickhonovich, A. V. Formation of an artificial vagina in a case of its congenital absence, according to Baldwin's method as modified by Constantini. *J. Akusb. i Zbensk. Boliez.*, 38: 301–305, 1927.

Wright, T. Congenital absence of the vagina, accompanied by marked nervous symptoms; Baldwin's operation and removal of ovarian tissue. *Am. J. Surg.*, 36: 114–115, 1922.

A SERIES OF 84 CASES FOLLOWING BILATERAL VASECTOMY FOR THE PREVENTION OF POSTOPERATIVE EPIDIDYMITIS*

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CAREFUL investigation of the records of the cases on the Urological Service of the Long Island College Hospital revealed the fact that the incidence of infection of the epididymis was 50 per cent, some of the cases having a bilateral involvement. There seems to be little difference whether the prostatectomy had been done in one or two stages, and it was decided that for a period of six months bilateral vasectomy would be performed on all cases as a prophylactic measure against epididymitis.

At the end of six months no epididymitis had occurred, but as a result of this surgical procedure, two infections resulted, one requiring an orchidectomy and the other necessitating the patient staying in the hospital a week longer due to the fact that the scrotal wound had to be opened and drained. At that time, for these occurred in our first 10 cases, we had not perfected our postoperative care of the scrotum. Now our only dressing is flexible collodion placed on the wound at the time of operation, care being taken that the sutures are buried under the collodion and not sticking through it, so as to act as a wick for infection. The wounds are not touched for five days, at which time the sutures are removed, and another collodion dressing applied. Under this regime no infections have resulted despite the drainage that passes over the scrotum in suprapubic wounds.

It was brought to the attention of the department that the Brady Urological Clinic in Baltimore was ligating the vasa with a through and through silk-worm gut suture, encircling the vas and including a small amount of scrotal skin, tied tightly and allowed to remain for ten days, in order to prevent postoperative epididymitis. This method reduced their incidence from 33 per cent to 4 per cent. In view of the above 2 cases of infection following vasotomy, it was decided to adopt this method of occluding the vasa. We ligated 6 cases in the above manner, and 3 of them or 50 per cent developed epididymitis ranging from seven days to twenty-one days postoperative, and the method was dropped. In 1 of these 3 cases, the epididymitis caused chronic pain for a period of seven months, and at the end of this time an epididymectomy was performed; serial slides taken above and below the site of the ligation showed the lumen to be reduced in caliber but not totally occluded.

On our service 84 cases of bilateral vasectomy have been examined to date and there has been no incidence of epididymitis. Two cases developed unilateral swelling of the scrotal tissues the morning following vasotomy, which disappeared in four and five days respectively. These cases were not epididymitis, for at all times the epididymis was easily outlined and was not enlarged or tender. Whether these edematous tumors were circulatory or physiological due to surgical trauma we are not prepared to say.

A certain investigator, who sectioned vasa of experimental rats to see if the Steinach theory was physiologically true, reported that the part of the vas between the site of sectioning and the epididymis became enlarged and lumpy, and on open-

* From the Urological Service of the Long Island College Hospital. Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, Oct. 17, 1928.

ing proved to contain collections of live sperms. We have watched for this accumulation in our cases and have never noted it, probably on account of the age of our patients.

Analysis of these 84 cases shows that there were 65 prostatectomies for adenoma, 13 for vesical and prostatic carcinoma, 5 for vesical calculi and 1 for impassible stricture. All patients were over sixty years of age.

CONCLUSION

1. In our 84 cases of vasectomy there has been no incidence of epididymitis, but there were 2 cases of unexplained scrotal engorgement within twelve hours after operation which subsided within five days. We are led to believe that this was a circulatory phenomenon, as occasionally we encounter venous hemorrhage in this procedure, and we observed that the epididymis was at all times normal to palpation.

2. We do not regard the through and through ligation of the vas with silkworm gut as satisfactory a procedure in our hands as vasectomy.

3. The surgical after-care of the scrotal wounds is as important as the operation, and we have found that a collodion dressing properly applied has proved most satisfactory for this type of wound.

Such results lead us to advocate this procedure routinely as it adds six minutes only to the operative period. It can be done under local anesthesia in the ward dressing room. In theory the testicular harmones are increased by its use, and, most important, it prevents a complication that prolongs painful convalesence and occasionally may be dangerous.

DISCUSSION

Dr. McKenna. Dr. Rathbun and I began over a year ago to ligate the vasa through the skin as has been described. While we did not compile definite records, there seemed to be as many cases of epididymitis as when nothing had been done. Epididymitis is a very unpleasant complication of prostatectomy, and besides being a heavy burden for our old men to bear, may constitute the difference between recovery and a bad ending. We have recently undertaken vasotomy, and hope that removal of about an inch of the vas with ligation of the cut surfaces will prove adequate. This brings up another closely related subject in which we have been interested for some time at the Brooklyn Hospital. Our pathologist is a very exact investigator and is hard to convince. His reports on the prostates removed almost invariably include the term "chronic prostatitis." This he contends is microscopically present even when the gland is clinically obstructive and requires removal. It is readily explainable, therefore, that epididymitis should be a complication when we are operating in an already infected field.

It will greatly reduce the morbidity and somewhat lessen the mortality if this very disagreeable complication can actually be prevented.

Dr. Aschner. In 1925 I found the incidence of epididymitis in prostatectomy was 20 per cent at the Mount Sinai Hospital. At that time they were reporting on vas resection abroad and I took it up. Since that time I have been resecting a half inch of the vas deferens on each side just below the external ring, which is a cleaner place to work in than the scrotum. It is easily done under novocaine and the sutured wound covered with gauze and collodion. I have had no epididymitis in the cases I have done. I had one wound infection.

I noticed in a younger man of about fifty whose spermatogenesis was probably very active, that a cystic swelling of the globus major, a spermatocele, occurred on both sides.

As regards the etiology of epididymitis in prostatectomy, most of the prostates removed for fibroadenoma show chronic infection; a second factor is that we probably damage or injure the ejaculatory ducts. These things cannot be prevented. The next point is the apparent relationship to catheterization and the use of indwelling catheters. It is now my practice, whenever I expect to do a prostatectomy, to perform bilateral vas resection before putting in an indwelling catheter or a cystoscope. Epididymitis may occur after vas resection if infection has been introduced by instrumentation prior thereto.

Dr. Morton. The occurrence of an epididymitis following a prostatectomy is very annoying to the surgeon and to the patient.

In 1925, before the Association of Genito-Urinary Surgeons, I advocated doing a vasectomy in every case of prostatectomy. The best time to do this is after the catheter drainage is begun. The risk of two slight operations is almost negative and the advantage is twofold. First, an occurrence of epididymitis is almost sure to be prevented; and second, if there is any value in Steinach's observations, a temporary improvement of all the vital functions takes place after vasotomy.

I think Dr. Morgan has made a very good showing with the results of two simple procedures in preventing the complication of epididymitis.

Dr. Ravich. I am very much interested in the splendid results obtained at the Long Island College Hospital with vasoctomy as compared with the results obtained from vasoligation as practiced by Young and his coworkers. Following my visit to the Young Clinic at the Johns Hopkins during the American Urological Meeting held in Baltimore in May, 1927, I began to do bilateral vasoligation on my service at the Brooklyn Jewish Hospital. I had performed about 15 to 20 but from my general impression of the results obtained, it seemed to me that there had been no material decrease in the incidence of epididymitis following prostatectomy. The cases of epididymitis following this procedure may not be due to the operation but to the fact that most of the patients had been manipulated previously either by cystoscope or catheter before reaching the hospital and the process ending in the epididymitis may have begun before the vasoligation had been done. However, the results have been quite discouraging and prompted me practically to abandon this procedure entirely.

Dr. Valentine. Routine bilateral vasectomy has been used on Dr. Stevens' service at Bellevue Hospital for some time. Dr. Cashman, ex-resident of the service, thinks we had seen only 2 cases of epididymitis following resection of the vasa. These, we thought, were due to the fact that the patients had been catheterized before vasectomy had been performed. The Brady Institute technique of ligation through the skin of the scrotum failed in our hands. Dr. Morton's suggestion of doing a vasectomy before any form of vesical drainage is instituted is very important. Regarding the site of incision necessary to expose the vas, we have never tried the high incision suggested by Dr. Ashner; we have always made it in the scrotum and have not seen any infections following this.

Dr. Read. This report was based on the work of all the men on the service, and these figures are quite accurate. In one case we thought we had tied off the vas but it slipped away and only the fat was tied. That was one of the failures; while it is simple to pick up the vas and tie it, sometimes it slips away. This is a possible explanation of reported cases of epididymitis after resection.

GOITER & ENDEMIC CRETINISM*

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SEATTLE

ONE travelling through a country where endemic goiter has long been prevalent, cannot fail to notice the large number of the inhabitants showing the stigmata of endocrine disturbance, dwarfs, cretins, myxedematous individuals, deaf mutes, etc. This is so noticeable in Switzerland that Professor de Quervain of the University of Berne relates this anecdote: "A traveller passing through Switzerland saw a cretin. Turning to his companion he remarked, 'There you see the typical Swiss.'" Such a statement, of course, is absurd for the true Swiss is a remarkably fine specimen of the genus Homo.

For generations the incidence of endemic goiter has been high in Switzerland and in common with other countries where this condition exists, degeneration changes of the thyroid have steadily progressed resulting in a large proportion of the people being physically and mentally affected. In these countries one never sees the toxic goiters which are so common in the United States and exophthalmic goiter is almost never seen.

It will be interesting to learn what results will be obtained in lessening the incidence of cretinism by the use of iodine in goiter prophylaxis which is now being carried on in Switzerland under Government supervision. Whether cretinism is due entirely to a thyroid deficiency or is a polyglandular disturbance, is a moot question. There is no question, however, that the thyroid disturbance is *not* the main factor. To quote Biedl.[1] "The thyroid gland, if not the conductor, is at least the first violin of the incretory concert."

The endocrine glands are so dependent one on the other, that a deficiency of one disturbs the normal function of the others; making it difficult to determine which symptoms are due to disturbance of function of individual glands; and the fact that nearly all symptoms are improved by the administration of thyroid extract does not prove tha the thyroid gland alone is at fault.

The anatomical changes found in the thyroid glands in cases of cretinism show an exceedingly wide variation. The gland may be entirely absent; marked fibrosis or some remnant of the gland may be present but with few of the acini preserved; and occasionally the gland may escape severe damage. In the latter case, usually some other gland of internal secretion is found deficient. In such a case Adami found a lesion of the pituitary gland.

Many cretins have large goiters, the goitrous growth involving practically all of the thyroid. Many of these become cystic and are so large that the patients wear cloth slings about their necks to support the weight. The goitrous cretin usually attains a slightly larger stature than the athyroid type, the mentality, however, being the same.

There is quite a marked difference in the mentality of the cretin, ranging from the so-called vegetable man to those who are capable of self support. If the child is born with no thyroid, he develops neither mentally nor physically, the so-called plant man. This congenital athyroidism is a malformation and is not confined to countries where cretinism is endemic and the cause is obscure. Where thyroid insufficiency develops at a later period, after a certain amount of physical and mental development have taken place, dwarfism and idiocy will be less marked the child may not be an idiot, but simply weak-minded. If still further mental and

[1] Biedl, A. Organotherapy. Harvey Lectures, 1923–1924, p. 27.

* Read at the Annual Meeting of the American Association for the Study of Goiter, Denver, June 18–20, 1928.

physical development have occurred before the insufficiency of the thyroid, the child will only be slightly affected both mentally and physically, the so-called backward child. These lighter cases of cretins may be taught to partially support themselves, and are able to work on the farms and to handle teams.

Geographic Distribution. In 1921, Dr. Murray B. Gordon, made a survey of the incidence of cretinism in the United States and Canada and reported 280 cases, exclusive of 60 cases previously reported by Dr. Osler. The location of these cases is as follows:

Canada	52	Oregon	3
New York	120	Rhode Island	3
Pennsylvania	25	Maine	2
Indiana	12	Missouri	2
Ohio	10	Nebraska	2
Massachusetts	6	Arkansas	1
Minnesota	6	North Dakota	1
Virginia	6	Montana	1
Kentucky	5	Washington	1
Iowa	5	Kansas	1
California	4	Colorado	1
Maryland	3	Louisiana	1
Illinois	3	District of Columbia	1
Wisconsin	3		

Analyzing the distribution of these cases, it is apparent that cretinism is not confined to the goiter belts and Dr. Gordon comments that: "Even though goiter is endemic in Canada along the St. Lawrence, in the Allegheny Valley of Pennsylvania and along the Great Lakes, not a single case of endemic cretinism was found and the incidence of so-called sporadic cretinism was no greater than in other regions."[1]

Dr. Gordon's findings have been similar to my own experiences. I have been practicing for twenty-seven years in a distinctively goitrous belt and I have seen but one case of true cretinism in my own practice during that time. Complying with a request from Professor de Quervain of Berne, Switzerland, to secure for him a motion picture film of cretinism in the United States, I had great difficulty in finding any cases of true cretinism. Cases of cretinism were reported to me from various parts of the country but, upon observation, I found the majority of them to be Mongolian idiots and others, simple defectives; however, in an institute in Columbus, Ohio, for the feeble-minded, I located a group of 10 cases which were true cretins. These cases were quite interesting and varied from the vegetable man to those who showed a slight degree of intelligence. Another interesting fact from Dr. Gordon's survey, is that there are twice as many females affected as males. The hereditary influence is quite distinctive where cretinism is found in Switzerland, and consanguinity appears to be a very active factor in the etiology.

In a personal communication from Professor de Quervain he states:[1]

> The etiology is in my mind the same as the one of the endemic goiter, but at a higher degree. I agree more or less with the standpoint of McCarrison and Galli-Valerio and I think the iodine in physiological doses is able to prevent the effect of that intoxication; and that cretinism may be more or less improved but not healed by thyroid treatment. Iodine prophylaxis will probably be helpful against goiter and cretinism, but we will not be able to have the results before ten to twenty years. It is too early to talk at this moment of a reduction of incidence of cretinism.

Prof. Ludwig Pick of Berlin, in a personal communication states:[2]

> Endemic cretinism can only be found in Germany where endemic goiter is. From this fact, two fundamental theories have been deduced: 1. That endemic cretinism is only a further development of the changes in the thyroid which one finds in endemic goiter. The etiological factors responsible for endemic cretinism are more complex than those found in endemic goiter. 2. Endemic cretinism is not developed as a further stage in endemic goiter, but runs parallel and independent of endemic goiter, which is caused by the same or similar

[1] Paper given before Association for Study of Internal Secretions, June 6, 1921.

[1] Personal communication from Professor F. de Quervain, Berne.

[2] Personal communication from Professor Ludwig Pick, Berlin.

factors. But in addition to these facts, one must consider that endemic cretinism consists of a higher degree of parenchymatous changes in the thyroid. The same etiological factor or factors are at the basis of endemic cretinism, endemic goiter, and deaf-mutism in the same affected regions. There are however, individuals with endemic cretinism without endemic goiter. These views are advanced chiefly by the two Swiss investigators, Senior and Junior Bircher, Which one of these two theories is the more rational one, is still a much mooted question.

PATHOLOGY

Interesting pathological changes occur in the bones, a retardation of the centers of ossification and is well shown in young children by the roentgen ray. In common with achondroplasia there is a disturbance of the normal growth at the junction of the epiphysis and diaphysis. New bone cells on which depend the growth of the bone do not develop. As a result, the long bones do not grow in proportion to the rest of the body. This disproportion, however, is not so great as is seen in achondroplasia.

Retardation of calcification prevents the union of the epiphysis and diaphysis, and they may remain separate many years longer than normal. For the same reason the fontanels remain open long beyond the usual age for closing. Flattening of the bridge of the nose is also caused by abnormal bone development.

Besides the characteristic bone changes, myxedema is a very constant symptom, and a subnormal metabolism is always found, where the intelligence of the patient permits a basal metabolism test to be satisfactorily made.

DIAGNOSIS

In the majority of cases, the diagnosis is not usually made until the child is several months old; and the child may be one or two years old before any abnormality is noticed. A sufficient amount of thyroid secretion in the early months may be furnished by the mother's milk to hold the disease in check until after the child has been weaned.

The physical and mental defects of a typical case can seldom be mistaken. The diseases which may be confused with cretinism are rickets, Mongolian idiocy and achondroplasia.

In rickets, the shape of the head, the characteristic bony changes, and the rosary are usually sufficient to cause recognition of this disease. In cretinism the hands are short and spade-like, while in rickets the fingers are long and beaded.

In mongolism the hands are normal, the head brachycephalic, the anteroposterior and lateral diameters being nearly equal, and there is the Mongolian slant of the eyes. As with cretinism, there is some incoordination of the movements; but such individuals lack the peculiar color of cretinism, their cheeks often being pink. There is no disproportion of the body, while in the cretin the limbs are too short for the body.

The administration of thyroid will have no affect on the Mongolian idiot while on the cretin the subnormal temperature will become normal after a few doses of thyroid substance.

Achondroplasia is present at birth, the characteristic feature being the extreme shortness of the extremities, the hands reaching only to the hips and the legs being proportionately short. The head seems larger, but measurement shows that it is not actually larger. Myxedematous puffiness about the face is not present as in cretinism; and, as the child grows older, there is no marked defect in mental development. After the first year of life, the roentgen-ray will show the characteristic delay in the development of the centers of ossification and the failure of union between the epiphysis and diaphysis of the long bones.

PROGNOSIS

Prognosis depends upon the recognition of the symptoms at an early age, and continuous and regular treatment. Untreated cases become idiots and dwarfs. A remarkable improvement will be obtained in the

physique and mentality of the child if the disease is recognized early and thyroid extract given continuously in suitable doses. Some cases will be almost normal; but usually more improvement is seen in the physical rather than the mental development. Cretins are very susceptible to infectious diseases, and few untreated cases live to adult life except in the milder forms.

TREATMENT

It remains to be seen what the systematic prevention of goiter will do toward lowering the incidence of cretinism. The early and continuous administration of thyroid, beginning with small doses and gradually increasing to tolerance will improve a large number of these cases; but many will still remain in a condition little better than high grade defectives.

WHAT SHALL BE DONE ABOUT GOITER PROPHYLAXIS?*

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THE question: "What shall be done about goiter prophylaxis?" is being asked with disconcerting frequency. The form of the query arouses the suspicion that all is not well with this measure. The Public Health Service with its ear, figuratively speaking, close to the ground frequented by health officers has noted growing dissatisfaction with the methods and results of goiter prevention during the past four years. Certainly there is no gainsaying the fact that the procedure has suffered a profound slump in popularity. However, as the principles underlying the prevention of goiter are sound it is desirable that disturbing factors be detected and, if possible, eliminated.

SCOPE OF DISCUSSION

In the present discussion only the prevention of simple, otherwise known as endemic, adolescent or colloid goiter is contemplated. However, the prevention of adenomatous goiter will be touched upon incidentally. The suggestion of Bram of Philadelphia, that exophthalmic goiter may be prevented by appropriate action is worthy of consideration, particularly in view of the apparent increase in the number of individuals afflicted with this malady.

No greater service can be performed in behalf of goiter prophylaxis at the present time than by restating and clarifying the principles upon which this procedure is based. Like many other apparently simple devices goiter prophylaxis requires a certain degree of precision in its application, as well as an appreciation of its limitations. Heretofore this understanding and attention to detail has been largely lacking.

CAUSES OF GOITER

Iodine and Goiter. By many persons simple goiter is erroneously believed to be due solely to the absence or deficiency of iodine in food and water customarily consumed. This conception is a particularly unfortunate one for it interferes materially with the successful prevention and treatment of simple thyroid enlargement. Iodine, of course, is intimately concerned with the maintenance of normal thyroid equilibrium. However, there are many underlying and relatively remote factors other than a deficiency of this vital element which are indirectly responsible for thyroid enlargement. The frank recognition of these facts will do much towards stabilizing and rationalizing the efforts in forestalling the occurrence of goiter.

Causes of Simple Goiter. In all probability simple goiter is due either to an absolute or relative deficiency of iodine. By an absolute deficiency is meant the shortage or absence of iodine from food and water. Deprived of an element essential to its efficient functioning the thyroid undergoes compensatory hypertrophy. But enlargement may also follow a relative deficiency of iodine. Demands for iodine in excess of available amounts often cause simple thyroid enlargement during puberty, pregnancy and lactation. Interference with the intake and utilization of iodine available in ample quantity, such as probably occurs in infections and intoxications, or when partaking of abnormal food combinations, also causes simple goiter.

Polluted Water as Cause of Goiter. McCarrison, the English investigator, believes that simple goiter is due to the

* Read at the Annual Meeting of the American Association for the Study of Goiter, Denver, June 18–20, 1928.

consumption of polluted water. Quite recently he has reported the disappearance of goiter from a village in India, following the substitution of a pure for a polluted water supply. McCarrison's experience in this respect has not been duplicated in the United States, for it has been found that simple goiter often increases when safe water is available. McCarrison, having recently produced simple thyroid enlargement experimentally by overfeeding with white flour, has decided that simple goiter, as encountered in the Old World, has a different etiology and consequently is a different condition from that found in the United States. However, there appears to be no scientific basis for such a distinction.

PREVENTION VERSUS TREATMENT

The failure clearly to differentiate between prevention and treatment has caused much confusion and misunderstanding. Many physicians, failing to reduce existing thyroid enlargements with iodine in prophylactic doses unqualifiedly condemn the measure. Quite obviously prophylaxis is intended solely for the maintenance of normal thyroid equilibrium. Existing thyroid enlargements are probably uninfluenced by ordinary prophylactic measures; if they are, the result may be regarded as incidental. Existing goiters require individualized treatment by a physician of experience and skill. Even under the most favorable circumstances the results of treatment may prove disappointing. In view of these facts the distinction between prophylaxis and treatment must be clearly understood and appreciated.

PROPHYLAXIS

Results of Prophylaxis. Doubt concerning the efficiency and safety of goiter prophylaxis has arisen in the minds of many observers during the past few years. Concerning the efficiency of the measure under suitable conditions there can be little doubt. Unfortunately, there are relatively few reliable reports of success following the systematic institution of prophylactic measures. The failure to record the progress of prophylaxis by periodical reexaminations of the same individuals constitutes a serious defect in present day management. Yet, despite the rather general absence of reliable reports there are a few records of strikingly successful outcomes which aid in preserving one's confidence in preventive measures. Among these may be mentioned the reduction of simple goiter among the school children of Seattle, Washington from 25 per cent in 1915 to 4 per cent in 1926. A decided decrease in goiters of considerable size has also been noted in Cincinnati after three years of effort.

Ill Effects Following Prophylaxis. From time to time disturbing reports of untoward effects following goiter prophylaxis have been forthcoming. It is well known, of course, that apparently benign goiters may suddenly be excited to hyperactivity through the use of abnormally large quantities of iodine. However, in these instances the suspicion remains that the toxic potentialities reposed in the apparently quiescent gland, merely awaiting a suitable stimulus for the production of the hyperthyroid condition. Moreover, in many of these cases iodine has been administered far in excess of physiological requirements. The histories of persons with toxic goiters often reveal the prolonged ingestion of unnecessarily large doses of iodine which were self administered, taken in patent medicine preparations or prescribed by physicians who failed to realize the poisonous potentialities of the element.

Essentials of Effective Prophylaxis. If there is a lesson to be learned from these untoward experiences it is that iodine is a poison and as such must be administered with caution. In order to be effective as a prophylactic and at the same time safe, the element must also be used with intelligence. The essentials of effective goiter prophylaxis, rather obvious but poorly understood, may be stated as follows: Efficiency, harmlessness, minute dosage,

palatability, low cost and ease of administration of the preparation used. Coupled with the rigid observance of these principles there must be intelligent supervision. Were these requirements accurately observed complaints of harmful effects following prophylaxis would be voiced less frequently.

General versus Individual Prophylaxis. Opinion, experience and practice as to the most effective method of administering prophylaxis varies widely. By some, individual prophylaxis is favored because nominal supervision is assured. However, this method must of necessity be limited in scope of application. Moreover, until a suitable automatic method of distributing needed iodine is devised no real progress in combatting simple goiter will be made. Pending the discovery of a measure meeting these requirements it appears advisable to favor individual oral prophylaxis.

Some authorities are inclined to favor general prophylaxis through the medium of iodized water, salt or other widely used food stuffs. Provided, of course, such foods contain sufficient iodine to prevent goiter without causing a disturbance of thyroid function, their limited use may tentatively be approved. There appears to be a real danger in the suggestion that many commonly used food products be artificially iodized. The Public Health Service has consistently advised against the iodization of any food but common salt, which is regarded as a preparation of merit and promise.

Iodized Table Salt. Iodized salt, justly or unjustly, has come to be regarded with suspicion because of reports of deleterious effects following its ingestion. Recognizing the possibility of harm to hypersusceptible individuals, those sponsoring the use of iodized table salt have recently caused the iodine content to be reduced to 1 part in 100,000 parts of salt. This minute quantity is believed to be adequate for the maintenance of normal thyroid equilibrium and at the same time is thought to be incapable of stimulating hypersusceptible thyroids. Such a preparation is now being marketed.

Prophylaxis during Pregnancy. Because of the prominence which has been given to the prevention of simple goiter during adolescence there has been a tendency to overlook certain closely allied features of prophylaxis. However, it should be emphasized that iodine, when properly administered during pregnancy, performs a far reaching service. The physiological demand for iodine during gestation is insistent even among women residing in nongoitrous territory. It is probable too that the so-called fetal adenoma of the thyroid gland may be prevented by the administration of iodine during pregnancy. This phase of prophylaxis assumes added importance when it is realized that malignant degenerations of the thyroid are frequently inaugurated in adenomatous tissue.

Far-reaching Effects of Prophylaxis. The deeper significance of goiter prophylaxis should not be overlooked. The effects of uncombatted simple goiter appear to be visited with increasing severity upon succeeding generations. Thus cretinism, mutism and idiocy, as well as other mental and physical degenerations, are the aftermath of uncontrolled simple goiter. The incentive for protective measures is increased when this relationship is understood. Another important reason for preventive measures is supplied in the conception that all goitrous diseases are stages of one process and usually culminate in toxic states.

When is Prophylaxis Indicated? Goiter prophylaxis is only one of many pressing public health problems. Hence, it becomes necessary to decide when specific measures of this character are justified in a given community. When major public health projects are already being slighted and the incidence of this affection is comparatively slight, it is manifestly unfair to begin an active antigoiter campaign. On the other hand when an efficient health organization exists and goiter is present to a considerable

extent prophylactic effort is plainly indicated.

The Test Survey. As a preliminary to the consideration of preventive measures there should be a test survey. Such an investigation made among high school students in conjunction with routine physical examinations, will indicate the relative incidence of simple goiter. Standard methods of procedure, such as those described by the United States Public Health Service, should be utilized preferably under the guidance of a person skilled in investigations of this type.

Information of value is provided by a well conducted goiter survey. Data gathered in this way indicate the incidence of goiter in the general population in a given community. The nearer the ratio of goiter incidence among boys and girls approaches 1:1, the greater is the general distribution of the malady. Then, too, the result of a goiter survey makes it possible to determine with fairness whether general prophylaxis is warranted.

Index for Prophylactic Effort. Rates of goiter incidence among boys and girls may be used as arbitrary indices of the need for general prophylaxis. When the percentage of all degrees of thyroid enlargement as determined by Public Health Service standards does not exceed 10 per cent and that among the girls does not exceed 20 per cent general prophylaxis is probably not indicated. Percentages ranging between 10 and 20 per cent among boys or between 20 and 30 per cent among girls probably leaves wide-spread prophylaxis in the optional class. When all degrees of thyroid enlargements among boys exceed 20 per cent and among girls exceed 30 per cent general prophylaxis is probably required. However, these suggestions should not deter physicians and public health officials from providing prophylaxis and treatment in specific instances, even when relatively few simple goiters are present in the general population.

CONCLUSION

Answering specifically the question: "What shall be done about goiter prophylaxis?", it should be emphasized that this procedure can no longer be regarded as a hit and miss affair. After learning the extent of goiter incidence, by means of a test survey, prophylaxis should be made available by the intelligent application of fundamental principles. Obviously results cannot be measured unless careful periodical reexaminations are made of those receiving prophylaxis.

If goiter prophylaxis is to occupy its rightful place as a beneficient measure additional thought and study must be devoted to perfecting the practical details of application. Other phases of goiter, as attested by a voluminous literature, have been accorded much earnest consideration. The general public appreciates the splendid advances in the diagnosis and treatment of existing goiters. The technical precision involved in operative procedure excites widespread admiration. Yet the prevention of goiter, while lacking in the spectacular and difficult to appraise in terms of efficiency, is a fundamental service which the people have a right to expect. There is nothing fundamentally wrong with goiter prophylaxis. The measure is scientifically sound, efficient and safe. However, continued efficiency and safety can only be assured by competent guidance.

REDUCTION OF THE MORTALITY IN THYROID SURGERY*

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IN the surgical treatment of hyperthyroidism many factors must be considered. The actual operation of thyroidectomy is of minor importance as compared with:

1. Early diagnosis and early operation.
2. In determining the operability of the patient.
3. The management of the patient in preparation for operation.
4. In choosing the optimum time for operation.
5. In choosing the type of operation to be performed, whether a single or multiple stage operation.
6. The postoperative management.

I will not discuss the question as to whether or not there is any fundamental difference between the various clinical types of hyperthyroidism, but for practical purposes will speak of two clinical groups: (a) toxic goiters and (b) exophthalmic goiters, which Lahey calls primary hyperthyroidism.

Toxic goiter (to be distinguished from exophthalmic goiter) is a clinical group of various histological structure, showing hyperthyroid manifestations of long duration, insidious in development, without a typical course; this type is apt to produce cardiovascular degeneration. These patients come to the physician particularly on account of the circulatory disturbances. The toxic adenomatous goiter is the principal representative of this type and is somewhat different in it's development of toxicity from that of the exophthalmic gland. The toxic adenomas are always preceded by non-toxic goiter and the non-toxic period may vary from one to more than thirty years.

Exophthalmic goiter is a clinical entity, the etiology of which is unknown. It is a condition in which all thyroid cells seem stimulated to increased activity, as though by some extraneous agent. It runs a typical clinical course with remissions, exacerbations and recurrences. The name exophthalmic goiter is inappropriate, because some cases show no exophthalmos and because exophthalmos, as a symptom, is often a late manifestation. On account of the seriousness of exophthalmic goiter and because of the fact that early surgical interference will prevent the serious visceral changes which usually occur, early diagnosis is important.

Furthermore, early diagnosis and classification is important because this type of goiter is progressive and liable to recurrences of the toxemia. The severity of the course to an individual cannot be foretold. Permanent tissue damage, resulting in invalidism, will occur if the toxemia is prolonged. Treatment should be instituted at the earliest moment that the diagnosis can be completed.

All toxic goiters, other than the exophthalmic type, demand early surgical treatment to prevent myocardial complications. The toxic adenoma is the most important one in this group. Goiter cases, in whom the heart has become decompensated during the course of typical acute exophthalmic goiter, are less liable to permanent myocardial injury following recovery, than are those of long standing nodular goiter with increased metabolism.

An early operation for adenomas of the thyroid, without symptoms or with very mild symptoms, should be as near free from danger as is any surgery. This may seem like a radical surgical idea but when

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one sees large numbers of patients with badly damaged hearts, the results of long standing toxic adenomas, many of whom die needlessly early deaths, one feels that the idea deserves serious consideration. Even though patients with severe toxic adenomas come safely through the operative procedure, they usually have suffered irreparable damage to the heart muscle. With early operation in cases of adenomas of the thyroid, the mortality should be practically nil and in exophthalmic goiter the death rate should be extremely low.

There are certain groups of cases in which the operation of thyroidectomy is especially hazardous, and in such cases the preparation for operation and determining the time and type of operation is of great importance. The groups of goiter cases in which the hazard of operation is especially great are:

1. Cases of hyperthyroidism in adults in which the toxic symptoms are marked and of long standing.
2. All cases of marked hyperthyroidism in children.
3. Cases of toxic adenomas in elderly patients with a marked myocarditis.

The principal conditions which contribute to the risk attending hyperthyroidism are:

1. Marked loss of weight within a short period of time and accompanied with extreme exhaustion.
2. Myocardial changes with cardiac decompensation.
3. Dehydration and impending acidosis.
4. Instability of the nervous system.

Much can be done to alleviate these conditions and render the patient a better operative risk. The excessive metabolism, which has resulted in this rapid loss of weight, demands rest in bed and sedatives to control the hyperactive nervous system. Of all measures designed to combat the high metabolic rate, rest and iodine are the most useful. To obtain the best results from rest, particular attention must be given each individual. Exophthalmic goiter patients do not adjust themselves readily to rest in bed and they must be personally instructed and persuaded to control their ceaseless, wasteful movements and excited conversation.

Besides rest in bed, careful attention should be given to the diet. Most thyrotoxic patients show a striking undernutrition when they present themselves for treatment. This loss of weight is due to an inability to meet the high caloric requirement of their increased rate of metabolism. The food intake being insufficient the body tissues are consumed to meet the deficit. To meet this high rate of metabolism the intake of an enormous amount of food is demanded. In spite of the fact that most of these patients have a good appetite it oftens requires considerable ingenuity to furnish a diet, containing the required caloric contents, which is not too bulky and which will not cause any gastric upset. In general the diet should contain a low protein content and carbohydrates should be given in plentiful amounts. The question of proper and sufficient food is of great importance in the preparation of the thyrotoxic patient for operation and, also, during the postoperative period.

Debydration. Thyrotoxic patients frequently show evidences of marked dehydration when they present themselves for treatment and many have an acidosis. Fluids should be forced in all cases and should be at least 3000 c.c. daily. The fluid intake need not be confined to water. Ginger ale and fruit juices are doubly useful, in that carbohydrates are also furnished. In patients with intense toxicity, with rapid loss of weight, there is often a gastrointestinal crisis manifested by diarrhea and vomiting. These patients are dehydrated and it is obvious that a considerable breakdown of the tissues has occurred to meet the demands of their high metabolism. In such cases the indication for fluids is imperative and in addition to fluids by mouth, saline solution should be given subcutaneously. If acidosis is present, glucose should be given along with the normal salt infusion, or by the intravenous

administration of 500 c.c. of a 10 per cent solution. If given by the intravenous route the flow should be so arranged that one hour will be consumed in giving the 500 c.c. of glucose solution. If given more rapidly a considerable portion of the glucose is apt to be excreted in the urine.

When delirium develops in a patient with acute hyperthyroidism, we are confronted with one of the most serious problems in connection with the disease. The transfusion of whole blood is indicated and often brings about an immediate improvement. By the use of iodine, saline infusion, blood transfusion and sedatives, most patients will recover from their delirium. In some instances a true pyschosis may develop and in such cases, a guarded prognosis should be made both as to the immediate and ultimate result. Unless the delirium in the acute thyrotoxic case can be relieved by medical treatment, it is futile to attempt surgery. Experience has shown that the mortality is practically 100 per cent when surgery is attempted upon the delirious thyrotoxic case.

There is considerable controversy about the use of digitalis in thyrotoxic cases. Crile does not think that digitalis given cautiously can be harmful to the goiter patient. He administers it before operation to most patients in whom myocardial changes have developed. Plummer believes that digitalis is contraindicated in practically all toxic goiter cases and claims that the operative mortality in their clinic was reduced as soon as they discontinued the use of digitalis both preoperatively and postoperatively. During the past two years, we have followed Plummer's suggestion and discontinued the use of digitalis in exophthalmic goiter cases, except in patients with auricular fibrillation. It is in these cases, and in these only, that we have found appreciable benefit from digitalization.

Auricular fibrillation is the most common heart complication and it is essential that this condition be, as much as possible, controlled before operation. It should be remembered that this state of the heart is a result of thyrotoxicosis and that digitalis alone may fail to produce results. Iodine in combination with digitalis will often bring about a normal rhythm. Cases in which fibrillation is of recent occurrence do well, those of long duration do less well, even though the basal rate is relatively low.

Iodine is the only drug of demonstrated merit which tends to reduce the metabolic rate in hyperthyroidism. It's present extensive use in the treatment of exophthalmic goiter is due particularly to the work of Plummer of the Mayo Clinic, who first placed it on a firm clinical basis.

Iodine has proved to be an important addition to the preparation for operation of patients with exophthalmic goiter. By it's use one is able to perform thyroidectomies, as a primary operation, in many cases which otherwise would have required preliminary ligations. Iodine, in the form of Lugol's solution, seems to be the most satisfactory and should be given preoperatively until it is evident that the most marked degree of gain has been made, as evidenced by improvement in symptoms and drop in the metabolic rate.

The dosage of iodine used in the preoperative treatment of exophthalmic goiter varies from 10 to 30 drops of Lugol's solution given, well diluted in water, after each meal. If the patient is having a thyroid crisis, accompanied with vomiting and diarrhea and will not tolerate iodine by mouth, the intravenous administration of iodine in the form of sodium iodide has proved satisfactory. There are certain points regarding the preoperative use of iodine, however, which should be considered. Early in it's use, it was frequently noted that severely toxic cases appeared to be in better condition than was actually the case, as has been pointed out by Lahey, so that it was found to be inadvisable to operate at the time of the apparent maximum improvement.

Iodine as a preoperative medication, when effectual, appears to accomplish it's

greatest good in a period of eight to fourteen days. Following this there is a period when there is no further improvement and beyond this, a period when a great many cases lose a good part of the improvement which they had shown under the administration of iodine.

The beneficial results from the use of iodine in exophthalmic goiter cases can seldom be duplicated if operation is delayed and later a second course of iodine therapy is given. It is not uncommon to see cases so greatly benefited by a course of iodine that they refuse to be operated upon, thinking that an operation can be avoided. Later on, they return with the same or more marked symptoms and when a second course of iodine is given, they fail to show the same improvement as they did with the first course of treatment.

In a certain group of cases, even after most careful preparation, there is a question as to whether or not a thyroidectomy can safely be performed. In most of such instances, a lobectomy should be performed. I am convinced that a lobectomy is a safer operation, in many cases, than a complete thyroidectomy. If, after lobectomy, there should be less reaction than was expected the other lobe can be removed two days later. In most cases, however, it is best to wait six weeks before removing the second lobe.

The operation of preliminary ligation is seldom done in our clinic at the present time. Last year 700 patients were operated upon for goiter and a preliminary ligation was made on only 5 cases. Some clinics have entirely discarded the operation of ligation, but I still believe that in a small percentage of cases a ligation is indicated, especially in children.

Children with hyperthyroidism should be handled with special care. Hyperthyroidism in children is usually characterized by an abrupt onset and even after the most painstaking preparation, they are apt to react seriously to any operative procedure. The operation should be so planned as to require a minimum amount of anesthetic and the surgeon should be prepared to interrupt the operation at any time. Excellent results often follow ligation in children, the improvement often being more striking than in adult patients. A special word of caution should be offered regarding the danger of performing tonsillectomies in the presence of hyperthyroidism in children; for the reaction may be much more severe even than that which follows the thyroidectomy. In these cases it should be the routine procedure to perform the thyroidectomy first.

In toxic adenomas of long standing in elderly people, the precautions and special measures outlined above for exophthalmic goiter cases, are equally applicable. It was formerly thought that the toxic adenoma cases could not be given iodine safely. Experience has proved that Lugol's solution, given over a short period of time, will have a beneficial effect, but the improvement is not so striking as in the majority of exophthalmic cases.

In all cases of toxic goiter the selection of the optimum time for operation is a very important matter. The ill-advised timing of operation is responsible for considerable mortality. It was formerly thought that the basal metabolic rate provided a fairly safe guide for operability in toxic goiter cases. Experience has proved this is not true. Increased metabolism is only one sign of increased activity of the thyroid gland and is not pathognomonic of thyroid disease. It is like any other laboratory test, it must be taken along with the clinical picture, or it may be very misguiding.

It is true the metabolic rate will tell us at what rate the patient is burning up his tissues, but it does not tell us the patient's ability to stand this increased rate of metabolism. In determining the operability of a toxic goiter case, there are other factors of far greater importance than the metabolic rate:

1. A rapid loss of weight, especially if accompanied by marked exhaustion, indicate bad risk patients.

2. The emotional stability of the patient must be taken into consideration.

3. The condition of the myocardium and the estimable reserve of the patient are of great importance.

4. Conditions affecting the social life of the patient from the standpoint of worry, are of importance. Worry may cause intense anxiety to a hypersensitive thyroid patient, and thus exert a real influence upon their postoperative condition.

A patient who is extremely apprehensive and excited, talks rapidly and almost incessantly, is restless and emotionally unstable, is not a good operative risk, even though the heart has responded well to rest and treatment, the pulse is reduced and the basal metabolic rate is comparatively low.

There is no single index for the optimum time for operation. We believe that no laboratory or single clinical test takes the place of the experienced surgeon's judgment as to operability under the conditions surrounding each case.

The handling of a goiter patient before operation is an important factor. If one has the confidence of his patient, I see no reason why he should not understand fully about the operative procedure, the same as any other patient. I always inform the patient as to the time and nature of operation to be performed and explain why it is necessary that they should have preliminary treatment before operation. The patient should be assured that no operation will take place until condition is such that the operation is safe. I have found that under this plan, these patients are not apprehensive about the operation and are anxious to have it done.

The Operation. On the morning of the operation, the patient is given a large dose of Lugol's solution, and 14 grain of morphine is administered three-quarters of an hour before the patient is taken to the operating room. For several years local anesthesia was used in practically all of my goiter operations. Recently, I have been using ethylene in a considerable number of cases and I can see no difference in the results.

The incision should be large enough to give adequate exposure of the goiter. The operation itself should be brief and without rough handling of the gland. The upper and lower pole of the gland should be entirely removed on both sides, leaving a small amount of thyroid tissue scattered along in the front of the posterior capsule if the gland which, of course, is always left in place. I have discontinued the practice of leaving one of the poles of the gland, because I believe that the remaining mass of thyroid tissue as the poles predisposes to recurrence of the disease. I leave a small drain in most cases. Lugol's solution should be given freely for forty-eight hours after operation. If, perchance, the patient cannot retain Lugol's solution by mouth it is best administered by giving sodium iodide intravenously.

After operation little reaction is to be expected, if the case is handled in the usual way. Occasionally a very active hyperthyroid patient may present a severe reaction. These postoperative febrile reactions are best controlled by the use of large ice-packs, as recommended by Crile. When the toxic patient develops a high temperature and delirium, either preoperatively or postoperatively, we find the use of the massive ice-pack, consistently, results in a decrease of fever and, coincidentally, the delirium disappears. It is necessary to use tremendous amounts of ice applied to the etire body, several hundred pounds of cracked ice sometimes being necessary. One must watch the temperature of the patient by frequent thermometer readings and discontinue the icepack when the temperature falls to 100°F. These delirious patients then go into a placid sleep and recovery is prompt. We have not yet seen a hyperthyroid febrile reaction which has failed to yield to a sufficiently large ice-pack.

We use morphine freely both preoperatively and postoperatively, it's use being designed to produce rest and sleep. We

find that patients who sleep well and long, hardly ever present any postoperative reaction. We take every means of getting water into our patients. Hypodermoclysis is used routinely postoperatively in all extremely toxic cases.

Complications. The two most common, serious, complications in thyroid surgery are:

1. Injury to one or both recurrent nerves.
2. Postoperative hemorrhage.

Injury of the recurrent nerve may be very distressing to the patient by causing dyspnea and an excessive amount of mucus in the throat. This complication is not borne well by a patient who has a marked myocarditis and may be the indirect cause of a mortality. In any case, where dyspnea seems to be causing embarrassment to the heart, a tracheotomy should be done.

Hemorrhage. The occurence of postoperative hemorrhage always demands immediate attention. When sudden dyspnea occurs in a thyroid case, the bandage should be removed and if hemorrhage is suspected, the patient should be taken to the operating room for reopening of the wound to control the hemorrhage. If the patient is badly cyanosed, immediate action is demanded. The wound should be opened at once and the clot removed. The wound can be packed open and a secondary closure made later.

The next most annoying complication is tracheitis. If this condition becomes alarming, a tracheotomy should be performed and the mucus in the main bronchi should be removed frequently by passing a catheter through the tracheotomy tube and aspirating the mucus with a suction pump.

Embolism. Embolism is of rare occurrence in thyroid surgery. As far as I know, it has not occurred in any of my cases.

Collapse of the Trachea. Collapse of the trachea does not occur as frequently as formerly since we do not encounter as many patients with very large goiters, whose trachea have been compressed and distorted for a long time. If collapse does occur, a tracheotomy is indicated. I have met with this complication only once during the past few years. This occurred recently in an exophthalmic case, whose thyroid gland was unusually hard and had caused pressure symptoms. Soon after the operation the patient experienced some difficulty during inspiration, there being no expiratory embarrassment. There was no nerve injury as her voice was normal. I was informed by the patient's husband that she had frequently had the same difficulty in breathing before operation, so I felt that her dyspnea was not serious. The dyspnea was gradually becoming worse and by the following morning, the patient was cyanosed and the heart markedly embarrassed. The wound was opened immediately and it was found that four or five of the tracheal rings would become absolutely flat during each inspiration. A tracheotomy was made, which gave immediate relief. The heart remained weak and rapid. The next day, she developed pneumonia and death occurred on the fourth day.

Infection. The incidence of infection is comparatively rare in thyroid surgery. The infection does not manifest itself until after any immediate thyroid reaction is over. With good drainage and hot, moist dressings, the infection will subside without serious consequence. The convalescence is prolonged and a disfiguring scar may result, but I have never had one of these cases develop a mediastinitis.

GOITER OPERATIONS DURING YEAR OF 1927

Colloid goiter		28
Adenomatous goiter		330
Exophthalmic goiter		343
Sarcoma of thyroid		1
Carcinoma of thyroid		4
Tuberculosis of thyroid		3
		709
Deaths		11 or 1.5 per cent
Thyroidectomies.	706 cases	8 deaths or 1.1 per cent
Ligations	5 cases	3 deaths or 60 per cent

SUMMARY OF DEATHS

1. *Exophthalmic Goiter. Thyroidectomy.* Fairly sharp reaction, but general condition good until third day, when patient developed an acute dilation of stomach. This condition persisted in spite of frequent gastric lavages. Death occurred on sixth day.

2. *Exophthalmic Goiter. Thyroidectomy.* Did not exhibit much thyroid reaction but died sixteen hours after operation from cardiac failure.

3. *Adenomatous Goiter* many years with cardiac decompensation. Ligation of both superior arteries had been done nine years previously.

Thyroidectomy. Condition good for twenty-four hours, when heart became rapid and irregular and death resulted twelve hours later from cardiac failure.

4. *Exophthalmic Goiter. Thyroidectomy.* Condition good for twenty-four hours when temperature suddenly rose to 106°F. Patient was placed in ice-pack and temperature dropped to 100°F. Pulse, temperature and general condition remained good for six hours when respirations suddenly became embarrassed, followed by death in a few minutes. The cause was undetermined.

5. *Exophthalmic Goiter. Ligation* right superior thyroid artery.

Condition fair for six hours when heart began to fail, death five hours later.

6. *Exophthalmic Goiter. Ligation* right superior thyroid artery.

Typical thyroid reaction, death in twenty-four hours.

7. *Exophthalmic Goiter. Ligation* right superior thyroid artery.

Severe reaction and death in twenty-four hours.

8. *Exophthalmic Goiter. Thyroidectomy.* Twelve hours after operation, patient suddenly developed respiratory obstruction and expired before the house physician arrived in the room. Examination revealed a tight swollen neck. Death was due to hemorrhage.

9. *Exophthalmic Goiter. Thyroidectomy.* Sharp reaction for twenty-four hours. Patient developed a tracheitis with an excessive amount of mucus in throat and bronchi, accompanied by attacks of dyspnea and cyanosis. Tracheotomy was done, followed by marked improvement but attacks of dyspnea and cyanosis recurred frequently and death resulted on the fourth day.

10. *Exophthalmic Goiter. Thyroidectomy.* Typical hyperthyroid reaction, with death on the fourth day.

11. *Exophthalmic Goiter.*

A girl sixteen years old with a very severe, acute exophthalmic goiter of three months duration, with marked loss of weight, delirium and persistant diarrhea and vomiting. After six weeks of treatment in the hospital including three roentgen-ray treatments, a ligation of the right superior artery was made. This was followed by a violent reaction. The left superior artery was ligated two weeks later. Reaction was not nearly so severe as followed first ligation. Considerable improvement followed ligations and patient returned home four weeks after second ligation. Patient did well for nine weeks when mother suddenly became insane, attacked the patient with a butcher knife, chasing her out of the house into the street. An acute attack of hyperthyroidism followed and one week later, patient was returned to hospital in an ambulance and in an extreme condition, even worse than on first admission. For two weeks condition was critical. Patient then began to improve and four weeks later a thyroidectomy was made and wound left wide open. Condition was very satisfactory for twenty-four hours, when patient suddenly became pulseless and died in a few minutes from cardiac failure.

SUMMARY

The principal factors which will tend to reduce the mortality in operation for toxic goiter are:

1. Early diagnosis and operation before permanent tissue damage has occurred.

2. The proper management of the patient in preparation for operation.

3. In choosing the optimum time for operation. The ill-advised timing of operation is responsible for a considerable mortality.

4. Judgment in choosing the type of operation to be performed, whether a single or multiple stage operation be done.

5. The operation should be comparatively brief, being careful to avoid injury to the recurrent nerves and the parathyroids.

6. The proper postoperative management. Prompt action in the care of any postoperative respiratory difficulty which may embarrass the heart. Delay, hoping that the condition may be better tomorrow, is often the cause of disaster.

Subtotal thyroidectomy by an experienced surgeon during the iodine stage of remission of symptoms, carries with it but a slight operative risk, if instituted before permanent damage to the circulatory apparatus has occurred. Under these conditions, exophthalmic goiter may be cured or at least controlled. The symptoms of hyperthyroidism should disappear and the basal metabolism rate should drop to normal following a subtotal thyroidectomy; otherwise an insufficient amount of the thyroid has been removed.

THE EFFECT OF IODINE AND THYROID FEEDING ON THE THYROID GLAND*

AN EXPERIMENTAL STUDY

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KANE, PA.

FOR several years we have accepted a didactic theory to explain the effect of iodine on the course of hyperthyroidism. This theory presumes that the toxic goiter secretes an abnormal substance, which has been designated deiodized thyroxin, and that iodine exerts its beneficial effect by supplying the iodine radical to this substance.

Recent investigations, however, have cast considerable doubt on this theory, as the following facts attest:

1. The theoretical abnormal substance has not been isolated; its chemical formula is unknown.

2. The theory fails to explain the relapse following an initial temporary improvement when iodine is given to patients with hyperthyroidism.

3. Several observers have demonstrated that the picture of hyperthyroidism can be constantly produced in the experimental animal by intravenous administration of normal thyroxin.[3,5]

4. Administration of iodine has no effect on the course of experimental hyperthyroidism, i.e., there is no effect on the circulating thyrotoxic substance.[3,5]

5. The studies of Reinhoff and Cattell who took specimens from patients before and after iodine medication have shown that an involutional change occurs in the gland itself.[1,4]

In view of this evidence it becomes increasingly more difficult to accept this theory. It is certainly much more logical to assume that iodine exerts its effect at the seat of production of the thyrotoxic substance than on the circulating toxin. It was, therefore, to determine something concerning the effect of iodine on the thyroid gland under various conditions that the following studies were made.

STUDIES

Adult dogs that had been fed the usual animal house mixed diet for several days were used. During the observation period they were kept on this diet, which was varied only by including iodine or thyroid extract. Small specimens were removed from the thyroid gland at the beginning of the observation period, at intervals after giving medication, and several months after the drugs were discontinued.

Group 1. After a section had been removed for microscopical examination, the dogs were given iodine in the form of Lugol's solution, 10 minims daily for six weeks, at the end of which time a second biopsy was done. After an interval of several months, during which no medication was given, another biopsy was done.

Group 2. After preliminary biopsy, the animals were given thyroid extract in increasing quantities until they exhibited symptoms of hyperthyroidism. A second section was taken. Iodine was then given for six weeks, at the end of which time a third section was taken. After a rest period of three months a fourth section was taken.

Group 3. In this group the rotation of drugs was similar to that in Group 2

* Read at the Annual Meeting of the American Association for the Study of Goiter, Denver, June 18–20, 1928.

except that the thyroid extract was continued during the six-week period when the animals received iodine.

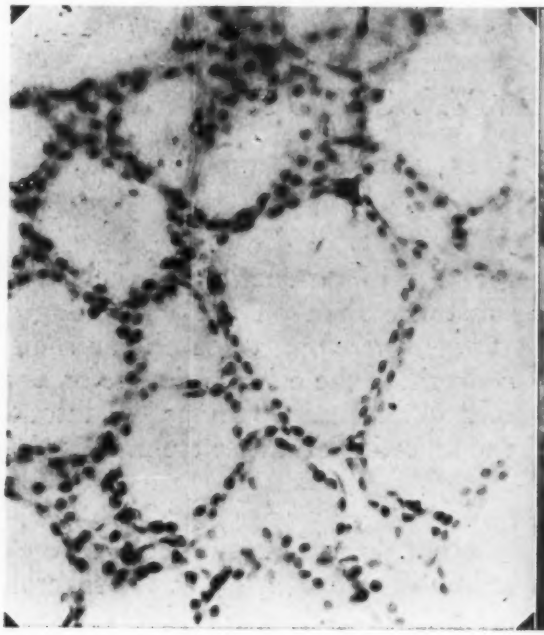

Fig. 1. Normal thyroid gland of dog; high power.

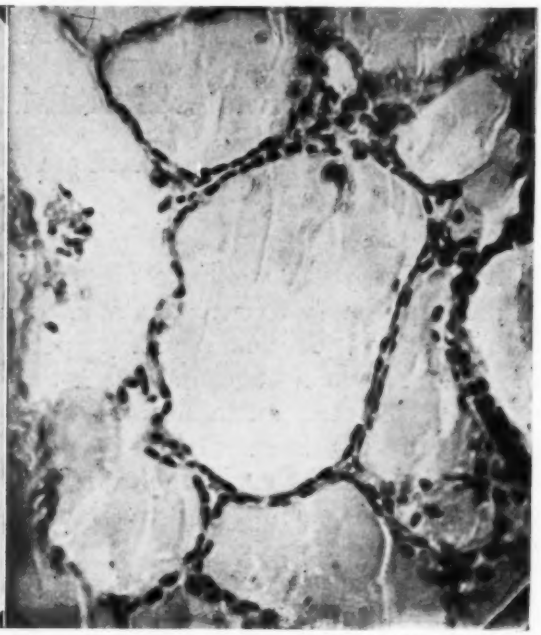

Fig. 2. Same animal, after feeding iodine for six weeks; high power.

RESULTS

The histological picture of the specimens removed from different animals after similar rotation of medication showed considerable variation, the most frequent variation being an absence of the typical iodine effect. As a rule, however, the histological picture was similar to that seen in the photomicrographs here presented.

Group 1. Figure 1 is a photomicrograph of the high magnification of the thyroid gland of a normal dog. Figure 2 is from the same dog after receiving iodine for six weeks. As compared to the normal gland, it will be noted that the acini are distended with colloid and, when seen under higher magnification, the cells lining the acini are distinctly flattened. It is reasonable to assume that ingestion of iodine has produced an increase in the amount of colloid which in turn has produced by compression a very evident distortion of the cells. This condition may persist for a considerable length of time as shown in Figure 3, which is a section from the same animal taken after a rest period of five months.

Group 2. A normal section is shown in Figure 4. After receiving thyroid extract for one month the section shown in Figure 5 (high power) as taken. It will be noted that the effect of thyroid extract is practically identical with that of iodine (Fig. 2), that is, the acini are distended with colloid and the lining cells are compressed. The thyroid extract was then discontinued and iodine was given for six weeks, at the end of which time a section was taken. This section showed practically no change from that taken after thyroid medication. In a few of the sections the amount of colloid was slightly increased. All medication was then stopped for three months. At the end of this period a section was again taken (Fig. 6). The morphological change in this section is very striking. When compared to the normal gland of the same animal (Fig. 4), there is no similarity of structure. The amount of colloid is greatly diminished. The cells are detached and lie free in the acini. Under higher magnification the cells are granular

and the cytoplasm is vacuolated. This stage, which occurred very frequently after prolonged administration of thyroid extract and iodine, was interpreted as a period of exhaustion.

Fig. 3. Same animal after a rest period of five months; low power.

Fig. 4. Normal thyroid gland of dog; low power.

Group 3. In this group, the same morphological changes occurred as in the previous group. The stage of exhaustion was identical with that produced in the dogs in Group 2.

INTERPRETATION OF RESULTS

We are justified in concluding from the examination of the various specimens that iodine stimulates the gland to produce colloid. This process continues during the stage of experimental hyperthyroidism. As the colloid increases, the cells are compressed and flattened. This mechanical compression may very possibly prohibit, at least temporarily, the usual secretory function of the cells. After prolonged administration of iodine and thyroid extract the cells become exhausted, show changes of degeneration and are no longer capable of producing colloid.

EFFECT OF IODINE ON THE HYPERPLASTIC TOXIC GOITER

The morphological changes produced by the administration of iodine to patients with primary hyperthyroidism have been well described. The acini are usually distended with colloid. The cells are transformed from columnar to low cuboidal and often are exfoliated and degenerated.

It is interesting to note the effect of iodine on a normal human thyroid. The acini are distended and the cells have changed from a columnar to a cubital type. The effect is quite similar to that produced in the experimental animal after iodine feeding (Fig. 2).

The most interesting group of patients from the standpoint of the present study are those who have taken iodine for a prolonged period of time and have come to operation after they have escaped from its benefit. Microscopical examination of these specimens shows a maximum effect of iodine. The cells are often degenerated, exfoliated and vacuolated. Clinically, however, the patients at the time of operation are often extremely toxic and represent a considerable surgical risk. Figure 7 (high

power) is from a patient who took iodine continuously for eighteen months. During her pre-operative hospitalization the basal rate dropped only 11 points. At the time of operation, she was considered a serious risk, although the section shows a maximum effect of iodine.

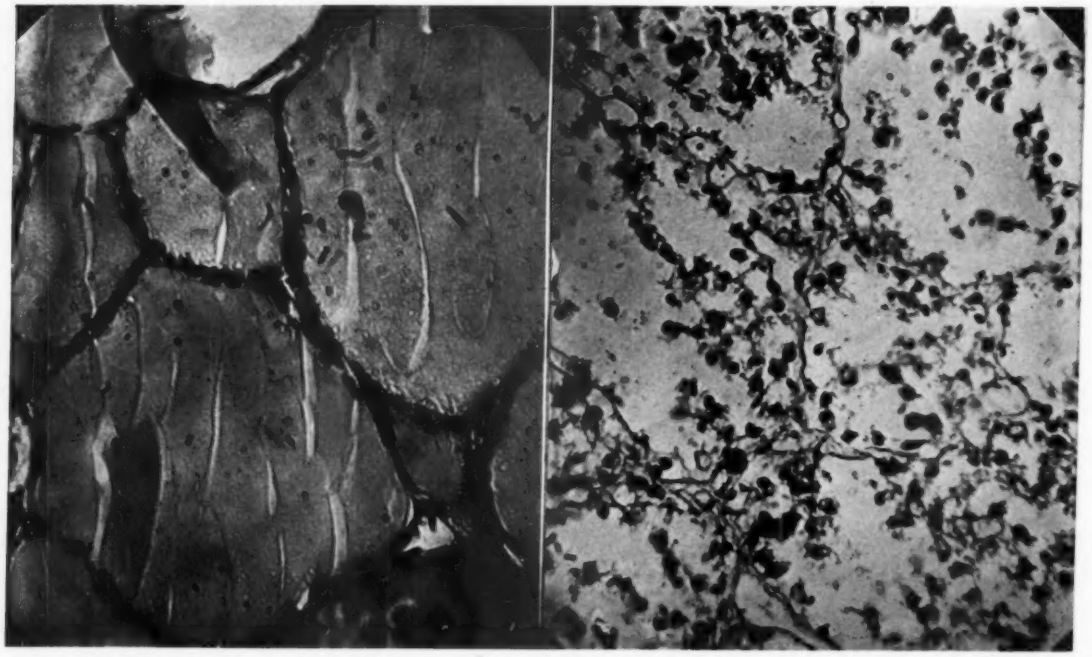

Fig. 5. Same animal after feeding thyroid extract four weeks; high power.

Fig. 6. Same animal after a rest period of three months; high power. Previous to this photomicrograph being taken, this animal had been receiving thyroid extract for four weeks and iodine for six weeks.

If the section from this patient, who took iodine for several months, is examined carefully (Fig. 7), a striking resemblance to the section taken from a dog after prolonged iodine and thyroid medication is seen (Fig. 6). It would seem that prolonged iodine administration in these patients has produced a stage of exhaustion in the gland similar to that produced in the experimental animal. This histological picture is interpreted by the pathologist as a "maximum effect of iodine," but the clinical status of the patient is that of severe and active hyperthyroidism.

Consideration of the facts here presented is, I believe, sufficient basis for a theory to explain the action of iodine on the toxic goiter. When iodine is first given the cells are stimulated to secrete an excessive amount of colloid. This colloid fills the acini and mechanically compresses the lining cells, thus reducing their secretory power. Less thyroxin is produced, and the patient shows clinical improvement. Gradually the cells adjust themselves to the changed condition and resume their secretory power. The amount of thyroxin is thus again increased and the toxic symptoms increase proportionately. Further iodine assimilation continues to stimulate the colloid producing function of the cells, but since excessive colloid production is an abnormal function to which the cells are not accustomed, they become exhausted, can no longer produce colloid, and on continual iodine stimulation they degenerate. However, even in the stage of exhaustion, they are still quite capable of carrying out their pathological function, that is, production of excessive amounts of thyroxin. The microscopical picture, which is usually interpreted as a specific effect of iodine on the thyrotoxic-producing properties of the cells, is in reality the effect of prolonged and excessive colloid production.

It is an interesting coincidence that Decourcy[2] from clinical observations has arrived at the same conclusion regarding the effect of iodine as is here presented.

CONCLUSIONS

1. In the experimental animal iodine stimulates the cells to produce colloid.

2. Colloid retention compresses and flattens the cells of the acini.

3. The same effect occurs from iodine administration in the presence of experimental hyperthyroidism.

4. Prolonged iodine administration to a hyperthyroid animal produces a stage of exhaustion in the gland.

5. The effect of iodine on the normal gland is similar to that in the animal.

6. The effect of iodine on the hyperplastic toxic goiter is similar to that obtained in the normal gland of the dog.

7. After prolonged administration of iodine (three to twelve months) to the patient with hyperplastic toxic goiter a stage of exhaustion is noted. This is similar to that produced in the animal by prolonged feeding with thyroid extract and iodine.

8. The clinical status of the patient is not proportionate to the histological picture when iodine has been taken for a prolonged period.

9. A theory to explain the action of iodine in the patient suffering with hyperthyroidism is presented.

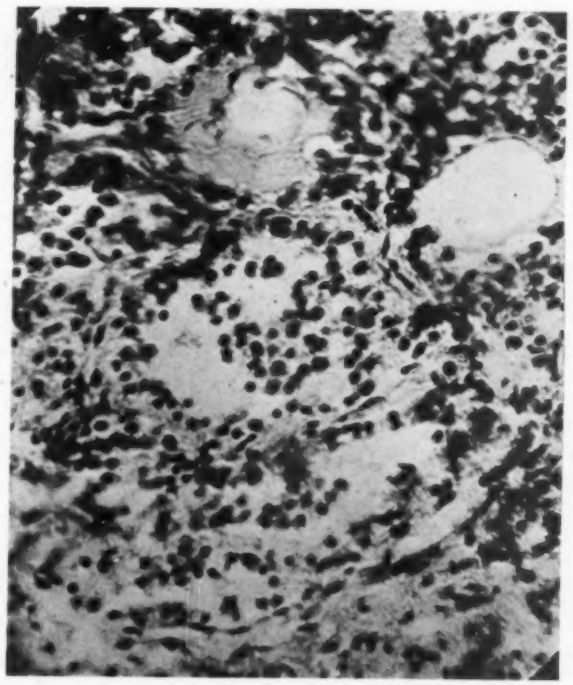

Fig. 7. Effect of prolonged iodine administration on hyperplastic toxic goiter; high power.

REFERENCES

1. Cattell, R. B. *Boston M. & S. J.*, 192: 989, 1925.
2. DeCourcy, J. L. *Ann. Surg.*, 86: 871, 1927.
3. Kunde, M. M. *Am. J. Physiol.*, 82: 195, 1927.
4. Reinhoff, W. F., Jr. *Bull. Johns Hopkins Hosp.*, 87: 285, 1925.
5. Sturgis and Badger. *J. Clin. Investigation*, 2: 289, 1926.

ARTERIAL EMBOLECTOMY*

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PERHAPS no procedure in the realm of vascular surgery has such brilliant possibilities as the early removal of an embolus lodged in a large artery. At first glance it might seem surprising that the literature of the past three decades contains so few references to such attempts, successful or otherwise. The explanation lies in the fact that the general practitioner almost invariably sees the case first and either does not recognize the early symptoms and thus fails to diagnose embolism or is not acquainted with the potentialities of early surgery.

In 1895 Ssabanejew[14] first attempted to remove an obstructing arterial embolus which he expected to find in the femoral artery of an extremity threatened with gangrene. He failed to locate the embolus. Subsequently, Moynihan,[11] Stewart,[15] Doberauer,[3] Trendelenburg,[16] Proust,[13] Schiassi and Murphy,[12] Carrell and Leriche,[2] performed arterial embolectomy but none was successful in re-establishing the circulation.

In 1911 Lahey[8] successfully removed an embolus from the femoral artery six hours after it obstructed the circulation. In the following year Key[5] of Stockholm also successfully removed an embolus of the femoral artery. In 1922 he published a review of 51 other cases from the literature[6] and his own experience with embolectomy ten times in 9 patients. In 8 of his 10 cases the emboli were located in the lower extremity and the other 2 were in the upper. The result was good in 6 instances. His publication, pointing the way to a broader field of usefullness, proved to be a great stimulus to such surgery.

It is estimated that less than 150 cases of embolectomy have been reported in the literature. Of this number 95 were performed in Sweden from 1912 to 1925, inclusive. In this series there were 17 operations in 15 patients by Key. Less than 20 cases have been reported from the United States, Canada and England. Since the publication of Key's paper there has been a steady increase in the number of cases reported outside the Scandinavian literature.

If an embolus is not removed soon after its lodgment in a vessel, it usually grows by secondary thrombosis. There is great variation in the lapse of time before thrombosis occurs. It may be present two hours after obstruction. Lindberg[9] reported femoral artery embolectomy twelve hours after obstruction at which a secondary thrombus 86 cm. long was found. Ipsen[4] removed an embolus two days after obstruction in which case there was no sign of secondary thrombosis. Such thrombosis increases the danger to the extremity. If the embolus is so shaped that it does not completely occlude the vessel when it is obstructed, thrombosis completes the ischemia. The peripheral thrombus formation diminishes or prevents the circulation through collaterals, thus making the prognosis still poorer.

Early recognition of the obstruction is of the utmost importance if favorable operative results are to be obtained, because as soon as the obstruction occurs secondary thrombosis may begin and the chances for the re-establishment of flow diminishes as time elapses. While Key[7] recently reported a successful result following axillary embolectomy forty-eight hours after occurrence of obstruction, and Lian and Maure[10] record one after twenty-nine hours' duration, an analysis of the result in a large number of cases strongly suggests the necessity of early recognition and intervention for successful outcome.

Emboli may arise from the heart, the

* Submitted for publication December 4, 1928.

pulmonary veins, the systemic veins or the arterial tree trunk. Willius[17] states that embolism of cardiac origin occurs in about 25 per cent of all patients dying of cardiac disease. No form of heart disease is free from the danger of embolism although the tendency is increased in valvular disease, particularly in mitral stenosis. Mural auricular thrombosis occurs frequently in myocarditis with auricular fibrillation. Thrombus formation is dependent on platelet accumulation. The latter always occurs with circulatory stasis. In myocarditis with auricular fibrillation the auricles fail to empty themselves. The consequent stasis favors the formation of thrombi. Thrombosis may be found in both sides of the heart and thus give rise to simultaneous pulmonary and systemic circulatory embolism with resultant infarction of the lung and gangrene of an extremity.

Embolism has frequently been reported as following an operation or parturition or complicating a septic process in all three instances in the absence of any demonstrable heart or gross vascular lesion. In the first two the process is not multiple.

The incidence of embolism is more frequent than the reported cases would suggest. In the examination of over 6000 necropsy records at Rik's Hospital, Oslo, Bull[1] found embolism of the vessels in the lower extremities 14 times and in the upper once. In 7 of the 15 cases there was no gangrene and in 13 instances the thrombus was in the cardiac chambers whereas in the remaining 2 it was in the aorta.

When a fragment of a cardiac valve or vegetation or a cardiac thrombus becomes detached, its course does not follow any definite order. It would seem that the larger the foreign body the more likelihood of its reaching the lower extremities. No matter which route it travels, however, it ultimately reaches a point in the lumen which is narrow enough to prevent further progress. This usually occurs at a bifurcation of the vessel or at a point where a large branch is given off. Here it lodges. If it remains long enough its shape is molded to that of the vessel at the point of lodgment, primarily by pressure and secondarily by the ensuing thrombosis so that it may become saddle-shaped or pronged. The projection of the embolus from the main vessel into both arms at a bifurcation or into a large branch and the production of distal secondary thrombi interfere with the establishment of collateral circulation. Thus there is a greater possibility of the development of gangrene.

SYMPTOMS

Invariably, the sudden blockade in a large vessel is heralded by a sudden, severe, stabbing pain in the affected extremity. This pain gradually diminishes in intensity as the nutrition of the extremity is progressively lessened. The other characteristic subjective symptoms are sensations of cold and numbness and disturbance of sensation. Objectively it is noted that the skin changes color, becomes marble-white, blotchy, ashen and later lividly mottled. Motility of the extremity is restricted and may be entirely lost. The temperature of the limb is lowered, the skin and tendon reflexes are lost and there is an absence of pulsation. These are all symptoms of ischemia. Since embolism often occurs in severe cardiac disease, an additional train of symptoms of prostration, tachycardia and dyspnea may be precipitated by the pressure of blood diverted from an extremity by an impassable barrier, and exerted on an already oppressed heart.

Key states that the marked circulatory disturbances may be preceded by prodromal symptoms due to lodgment of small emboli. In cases of femoral embolism before the development of ischemia there may be pain in both legs; but after the appearance of the circulatory disturbance the pain is definitely confined to one extremity. This is explained by the assumption that at the time of pain in both legs the embolism is straddling the aorta and momentarily partially obstructing both iliac arteries.

DIAGNOSIS

A history of sudden onset of pain, coldness, numbness, blanching, lowered temperature and absence of arterial pulsation in an extremity especially if the patient has endocardial or myocardial disease clinches the diagnosis of embolism. The condition must be differentiated from venous thrombosis in which the pain is distributed along the course of the veins, the extremity is warm, cyanotic and swollen, the sensation is not impaired and arterial pulsation is present. Arteriosclerosis with circulatory disturbance is easily distinguished by the gradual onset, slow extension of the process and recognizable vascular changes throughout the body. Endarteritiis obliterans offers no difficulties in the differential diagnosis. There should be no difficulty in recognizing embolism in a large vessel if the obstruction is complete.

LOCALIZATION

The localization of the embolus is frequently not difficult. Where the obstruction occurs in a vessel in an extremity, the point at which pulsations cease is often ascertainable. In thin individuals it may even be possible to feel a slight enlargement and an increased resistance at the site of obstruction. The height of the blanched, mottled or cyanotic area is in itself not a good indication of the level of the obstructing body because of the influence of collateral circulation. It must be remembered, however, that the embolus is always situated centrally to the upper limits of the ischemic area. The embolus usually lodges at a bifurcation or big branching. Thus in most cases operated on the obstruction was found at the origin of the common iliac, common femoral, popliteal arteries or in the axillary where the subscapular branches off. Difficulties may present themselves in cases of secondary thrombosis, multiple embolism or bifurcation lodgment with complete block of one side and incomplete block of the other giving rise to confusing symptoms unless such possibility is considered. However, when the location is in question, there should be no hesitation over an exploratory incision.

PROGNOSIS

The ultimate result is dependent among other factors upon the underlying cause. Many publications of successful embolectomies with complete restoration of the circulation are accompanied by a report of the patient's early death subsequently from other emboli, cardiac failure, sepsis, etc. It is significant that the best ultimate results are attainable in embolism following operative procedures or parturition where there are no demonstrable cardiac lesions. Here, there are usually no secondary embolic formations to influence the recovery. Naturally the prognosis depends in a large measure on early diagnosis and treatment, but a very important part is played by the localization of the embolus. Thus in operations for the removal of an embolus from the aorta at its bifurcation especially if the embolus be saddled so that both common iliacs be occluded, the prognosis is much more grave than in embolectomy in the femoral or popliteal arteries. A much larger portion of the vascular system has been thrown out of the circulation by occlusion at the aortic site and this in itself exerts a deleterious influence on the heart. In a series of cases tabulated by Key, in which operation was performed in the first ten hours after obstruction, of the axillary and brachial emboli three-fourths were successful, of the femoral one-half were successful, of the iliac one-third were successful and of the aortic one-seventh were successful. These same cases were tabulated according to lapse of time between occlusion and operation. Of 75 operated within ten hours 34 were cured. Of 14 operated between ten and fifteen hours after occlusion, 3 got well. Of 10 cases in which from fifteen to twenty hours elapsed before operation, 1 was successful. Of 13 cases in which the time interval was between twenty and thirty hours, 2 were cured. Of 9 cases operated on between thirty and forty-eight

hours after occlusion, 1 was successful. There were no successful cases in which occlusion lasted more than forty-eight hours.

TREATMENT

This resolves itself into two kinds. Where the obstruction is located in a small vessel and there is little likelihood of resultant gangrene, or where the patient's general condition precludes operative interference, non-surgical methods consisting of the application of heat and vigorous massage may be employed. In the former variety the success of such measures is almost certain; but in the latter, if the embolus is lodged in a vessel of fair size, the chances of success are few. Such cases develop gangrene more readily than if the vessel were occluded at the same point by ligature because with embolism there is a greater tendency toward secondary thrombosis, which, as previously stated, diminishes the possibility of the development of collateral circulation.

Where the embolus is lodged in a large vessel and gangrene impends and with the patient's condition permitting, the ideal form of treatment is embolectomy performed as soon as possible after the onset of obstruction. Delay is always contraindicated because the nutrition and vitality of the extremity become progressively poorer and the likelihood of thrombosis increases with the continued interruption of the circulation. If the case is seen late, embolectomy is still the operation of choice, because, even though the gangrenous processes have already begun, removal of the obstruction tends to restrict the spread of tissue necrosis.

It has been shown that the maintenance of the vitality of tissues to which the main arterial supply has been interrupted by ligation can be augmented by simultaneous ligation of the accompanying vein. The rationale behind the procedure is that the capillary pressure is thereby raised. This operation should not be performed where there is reasonable assurance of the success of embolectomy, namely, where the embolus has been removed early before thrombosis has occurred, where free bleeding follows the removal and forceful pulsations in the extremity are felt after the vessel is sutured. When, however, the removal of the embolus is accomplished in the presence of beginning gangrene, the operation having been undertaken with the hope of limiting the process, ligation of the accompanying vein is advisable.

OPERATION

The ideal form of anesthesia is spinal block. It is particularly valuable in cardiac cases because of its tendency to lower the blood pressure markedly. This diminishes the burden of an already overloaded and incompetent heart. It gives maximal relaxation which is exceedingly valuable for a direct approach in obese individuals in whom the embolus is lodged in the aorta, at the bifurcation or in an iliac vessel. It is applicable for attacking the vessels of the upper extremity as well as those of the lower.

An incision is made as near the site of embolism as possible. The vessel is exposed and the embolus located. It has been stated that if possible the arteriotomy should be done above the site of obstruction. To us it seems more logical to open the vessel below. It is far easier to prevent the peripheral distribution of fragments occasionally produced during the dislodgment and removal of the embolus. Secondary thrombosis is more easily recognized and treated, the restoration of free flow of blood after removal of the embolus is now not a matter of conjecture, because with the incision below the obstruction site free bleeding from the arteriotomy is plainly evident if the obstruction is removed, or there is not free bleeding if the removal is incomplete. The artery is therefore incised longitudinally below the embolus and the latter is extracted. Its removal is facilitated by gentle massage. If free bleeding follows, the vessel should be compressed by a soft nose clamp and the arteriotomy wound sutured.

The sutures of 000 silk doubled, threaded on a No. 12 sewing needle, may be interrupted or continuous. We prefer a continuous suture placed as shown in the accompanying illustration. It gives better occlusion. After the closure, the clamp should be removed and distal pulsations sought for. If a pulse is not felt, the vessel should be opened at a lower level and the occluding clot removed so that free bleeding is obtained. It may be necessary to wash out the clot between the two arteriotomy wounds with saline.

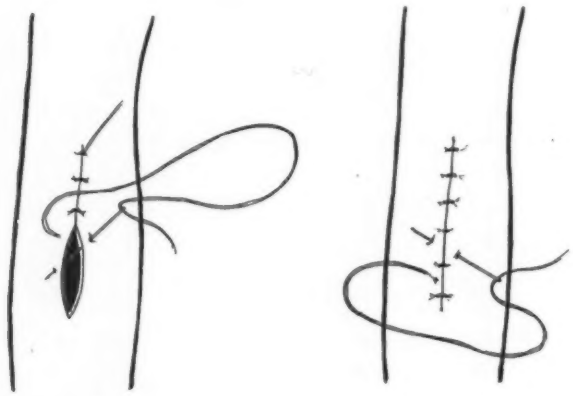

Fig. 1. Closure of arteriotomy wound by continuous suture.

If a direct approach to the embolus is not made, it may still be removed through an arteriotomy some distance distally to the obstruction site by probing and massage or the use of a long alligator forceps. Cases are recorded in which emboli have been successfully removed by the indirect method in some instances from the aorta by a femoral artery approach. The iliac arteries and the aorta may be approached either transperitoneally or retroperitoneally if the direct method is used.

When a saddle embolus at the aortic bifurcation is removed through a one-sided approach the other iliac or femoral should also be opened to insure freedom of that side from thrombosis as a result of partial vascular occlusion.

If re-establishment of the circulation is not possible, it is advisable to ligate the accompanying vein at the site of arterial obstruction or even centrally to that point. This is of material value in aiding the re-establishment of collateral circulation and limiting the amount of gangrene.

CASE REPORT

Case 1. A. S., a female, aged fifty-three, was seen in consultation with Dr. A. Stone on March 22, 1928 at 4:30 P.M. for embolism of the axillary artery.

The patient had been sick for several years with cardiac disease diagnosed as endocarditis with mitral stenosis, myocarditis with attacks of fibrillation, bronchitis and emphysema. She had decompensated on several occasions, and had been taking digitalis for the previous year.

Two weeks before admission to the hospital she had been orthopneic, and had been fibrillating but improved on digitalis. A week later she suddenly became comatose for a few hours and when she regained consciousness it was noted that she was speechless and had a left hemiplegia. For seven days she showed improvement steadily until at 3 P.M. on March 22, she suddenly felt a severe pain in the left upper extremity from the shoulder down into the hand. The extremity became numb and cold. Dr. Stone who saw her shortly after the onset of symptoms diagnosed embolism of the axillary artery on the history and the physical findings of pallor of the extremity, absence of pulsation of the radial and brachial artery and presence of pulsation in the left subclavian artery. She was operated on at 7 P.M. under spinal anesthesia. The axillary artery was exposed and the embolus located at about the middle third of the artery. A longitudinal incision was made about 1 cm. below the embolus. A thrombus about 10 cm. in length was removed from the peripheral portion of the vessel. The embolus was extracted with a pair of fine forceps. This was followed by a gush of blood. The bleeding was controlled by a soft-bladed clamp and the arteriotomy wound closed by continuous suture of doubled 000 silk. The artery clamp was removed and radial pulsations sought for but none was felt. The artery was opened about 10 cm. peripherally to the original wound. Free bleeding was encountered from the central end. Another piece of thrombus about 6 cm. was removed from the distal portion of the vessel, the second arteriotomy closed in a similar manner and then it was found that there were distinct and forceful pulsations in the radial artery of the

extremity. The wound was rapidly closed with a continuous silk suture. On March 23 1928, the day after operation, there was cyanosis of the lips, finger tips and toes. She was dyspneic and orthopneic. The tongue was deviated to the right, the veins of the neck pulsated markedly and filled from below upward. The heart was fibrillating, the ventricular rate being 128 while the pulse rate was 76. The apex was in the 5th interspace 11½ cm. to the left of the midline. There was a loud apical systolic murmur transmitted to the left. There were congestive râles at both bases. The abdomen was soft; there were no masses palpable. The left upper extremity was not edematous, the finger tips were somewhat cyanotic, but pulsations were distinctly palpable in the radial artery at the wrist although they were slightly weaker than those in the right.

On March 25, she complained of sudden pain in the left arm near the shoulder and almost simultaneously of a severe pain in the abdomen. The latter was excruciating and was rapidly followed by marked rigidity and distention. There was also a severe pain in the left lower extremity. The latter quickly became cyanotic as did also the abdominal wall. Pulsations in the left radial ceased. None was felt in the left femoral, popliteal or dorsalis pedis arteries. She voided only 1½ oz. of urine in twenty-four hours. The distention became worse, vomiting became almost continous, there were bloody stools, the pulse became rapidly weaker and on March 26 she died. Apparently she had a shower of emboli which lodged in the left axillary, left renal and left femoral vessels, in the aorta and perhaps the mesenteric vessels also. Unfortunately, an autopsy was not obtainable.

Case II. E. W., a female aged fifty-two, was admitted to the hospital May 3, 1928 complaining of sudden severe pain in left leg and thigh of eight hours' duration. She also complained of coldness of the extremity and inability to perceive touch. The extremity had a mottled cyanotic appearance extending from the toes up to about the level of the condyles of the femur. No pulsation was felt in the left dorsalis pedis, popliteal or femoral. She had been treated for more than a year for arteriosclerosis and myocarditis and during that time auricular fibrillation was a prominent feature of her clinical picture.

The patient's general condition was very poor. She was very obese, dyspneic, fibrillating, cyanotic and in all a poor subject for operative treatment. Nevertheless, under spinal anesthesia on a diagnosis of embolism of the left iliac artery, the upper part of the femoral artery was exposed by a longitudinal incision at the base of Scarpa's triangle. The artery was incised and a thrombus 20 cm. long was removed from the distal portion. The proximal portion was probed and a small thrombus removed behind which was an embolus. This could not be reached through the femoral arteriotomy so the latter was closed by the method described in the previous case report and the iliac artery exposed by enlarging the incision upward on the abdomen, incising the transversalis fascia above Poupart's ligament and pushing back the peritoneum. The iliac was incised and probed and an embolus removed from a point about 8 cm. centrally to the arterial incision. Free bleeding could not be produced in spite of careful probing. The bleeding which followed the removal of the embolus was slight, was not remittent in character and was under slight pressure. Apparently there was centripetal thrombosis. By this time the patient's condition was so poor as to contraindicate a continuation of the operative procedure, so the artery was sutured, the femoral vein ligated at Poupart's ligament, and the wound rapidly closed.

The following day the foot and leg were cold, cyanosed and numb. The patient was very dyspneic and cyanotic, the heart rate was greatly accelerated, the pulse deficit was 62 and in general she was very much worse. There was a tendency toward limitation of the mottling and cyanosis of the extremity by an irregular circular line at about the level of the condyles of the femur. The other extremity appeared and felt normal. Here cardiac condition rapidly grew worse and on the morning of the second day she died. At this time the extremity showed no further progress toward gangrene.

REFERENCES

1. Bull, P. What can more than 6000 postmortem examinations teach us about emboli and embolic gangrene of the extremities? *Acta chir. Scandinav.*, 54: 315, 1921.
2. Carrell and Leriche. Quoted by Key.
3. Doberauer. Quoted by Key.
4. Ipsen. Quoted by Key.
5. Key, E. Uber embolectomi als Behandlingsmethods bei embolischen circulations-stroungen der extremitaten. *Acta chir. Scandinav.*, 54: 339, 1921.

6. Key, E. Embolectomy in the treatment of circulatory disturbances in the extremities. *Surg., Gynec. & Obst.*, 36: 309, 1923.
7. Key, E. Embolectomy as a method of treatment for embolic functional disturbances of the extremities. *Zentralbl. f. Chir.*, 54: 2190, 1927.
8. Lahey, F. H. The treatment of emboli in the peripheral vessels. *S. Clin. North America*, 6: 657, 1926.
9. Lindberg. A case of embolectomy. *Acta chir. Scandinav.*, 56: 412, 1923.
10. Lian and Maure. *Presse méd.*, 33: 265, 1925.
11. Moynihan. Quoted by Key.
12. Murphy and Schiassi. Quoted by Key.
13. Proust. Quoted by Key.
14. Ssabanejew. Quoted by Key.
15. Stewart. The operative treatment of arterial thrombosis and embolism. *Ann. Surg.*, 61, 519, 1915.
16. Trendelenburg. Quoted by Key.
17. Willius. Embolic manifestations of heart disease. *J. Iowa Med. Soc.*, 16: 437, 1926.

BURSITIS OF THE FOOT

A NEGLECTED CAUSE OF DISABILITY*

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NEW YORK

A TYPE of foot pain which has received little attention from the writers of textbooks on orthopedic surgery is that due to irritation of one or more of the numerous bursae to be found in the foot. These structures occur as adventitious formations such as I have found in eleven different areas of the foot or as constant sacs, ten of which are known, and, although they are demonstrable on the cadaver, they are given scant consideration in current works on anatomy. The literature on the subject is extremely meager. Except for two papers by Arthur E. Hertzler of Halstead, Kansas, there are no contributions in English.

My own interest in the subject was awakened several years ago when, in operating for a calcaneal spur, I encountered a well-formed bursa lying between the inferior surface of the os calcis and the skin. It occurred to me at the time that the symptoms of painful heel were more likely due to bursitis than to pressure of the exostosis on the soft tissues under the heel. Since then I have observed painful heels without spurs and spurs without painful heels, which suggests that the importance of the spur as a pain-producing factor has been overestimated. In all subsequent spur operations I have looked for a bursa, which, as is rather generally known, frequently develops in this situation. If found, it was excised, and if not discovered, a thin layer of the subcutaneous tissue on the bottom of the heel was removed, experience having taught me that adventitious bursae not always capable of demonstration occur in the superficial fascia of the sole in this and various other situations.

A study of the histology of this subcutaneous pad will explain why this is so. The individual masses of fat are surrounded by delicate stromata of connective tissue and as these are grouped together membranous partitions are formed of two or more loosely connected layers between which spaces are seen from time to time which act as lymph reservoirs. Now, adopting the description of Clarkson, a well known English histologist, a bursa is nothing more than an enormously distended lymph space, the cells of whose connective tissue walls have through constant friction assumed the function of secreting a fluid more viscous than lymph which serves as a friction-reducing medium between two gliding surfaces. It is conceivable, therefore, that sacs may form in the subcutaneous tissue with walls not sufficiently dense to be recognized at operation, but which, nevertheless, possess when irritated the pain-producing characteristics of inflamed bursae elsewhere.

Appreciating the possibilities of bursal formations in the superficial fascia of the sole, I have on several occasions operated for what appeared clinically to be a bursitis in this region notwithstanding that the patient's complaints were those of "painful arches" which had been unrelieved by properly fitted metal plates. Although in only two instances have I been able to demonstrate well formed sacs, in the other cases portions of the subcutaneous tissue corresponding to areas of tenderness found at examination were excised. Complete relief from pain followed to the operations and the metal supports were discarded.

Hertzler, whose interest in bursae of the feet dates back more than twenty years, finds the subcalcaneal bursa relatively constant and, likewise, one designated as the anterior calcaneal bursa which lies

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between the origin of the abductor hallucis and the tendons of the long flexors as they pass from under the sustenaculum tali. He

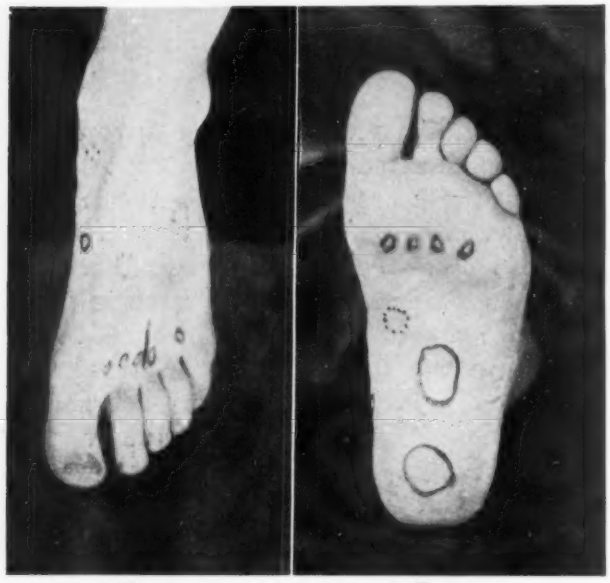

Fig. 1. Fig. 2.

Fig. 1. Bursae of foot, dorsal view. Constant sacs indicated by solid lines; occasional formations by broken lines. Straight line indicates incision to reach metatarso-phalangeal bursae.

Fig. 2. Bursae of foot, plantar view. Constant sacs indicated by solid lines; occasional formation by broken lines.

points out also that bursae lying over each of the metatarsophalangeal joints are responsible for anterior arch pain and he records many cures of so-called metatarsalgia by the simple procedure of destroying these bursae with a curette.

The symptoms which accompany inflammation of the bursae of the foot are not always localized, except those incident to subcalcaneal bursitis where the usual picture of "painful heel" occurs and those accompanying inflammation of the bursae adjacent to the lower extremity of the tendo Achillis. On several occasions I have operated on cases of painful heel where no spur appeared in the roentgenogram and no distinct sac was encountered at the operation. However, removal of some of the superficial fascia covering the tuberosity of the os calcis resulted in complete relief of pain just as it did in the cases of tenderness under the arch previously cited. The assumption is reasonable that in all these instances I was dealing with what may properly be termed occult bursae, the origin of which has been explained. Irritation of the anterior calcaneal bursa which lies between the origin of the abductor hallucis and the tendons of the long flexors and is a constant structure gives rise to symptoms which are usually interpreted as due to arch strain. One of my patients accumulated a useless collection of foot plates prescribed by various orthopedic surgeons during a period of two years, at the end of which time he was suffering so much that he contemplated giving up his position. Careful examination elicited a circumscribed area of acute tenderness corresponding to the anterior calcaneal bursa. As the man desired to avoid operation the painful tissues were compressed by an adhesive strapping, he was put to bed for ten days and continuous wet dressings were applied. He discarded his plates and resumed his work as a salesman at the end of two weeks, free from pain for the first time in two years. Notwithstanding the happy result in this case the patient was warned that excessive use of his feet may cause a recurrence of symptoms and necessitate an operation for obliteration of the bursae. This case illustrates a point in treatment. Acute cases may be relieved by the same measures which would be used in bursitis appearing in more usual regions, but in the chronic cases I believe it is better to operate without delay as the period of postoperative disability is short and the risk almost nil.

Another case illustrating the varied distribution of these bursae is that of a business woman whose pain was referred directly to the arch of one foot and was increased by walking and standing. In spite of treatment the disability persisted to a degree which threatened her business usefulness. Careful examination disclosed that her discomfort was due to inflammation of a bursa near the insertion of the tendon of the tibialis anterior. Compression of the affected area and rest gave her

temporary relief and the bursa will later be obliterated by operation if the symptoms recur.

Fig. 3. Bursae of foot, medial views. Constant sacs indicated by solid lines; occasional formation by broken lines.

Fig. 4. Bursae of foot, lateral view. Constant sacs indicated by solid lines; occasional formations by broken lines.

In addition to the bursae already enumerated there is a sac of considerable size lying between the short flexors of the toes and the flexor accessorius. Inflammation of this bursa produces symptoms referable to the arch, underneath which it lies, and as friction upon it is increased if the arch is depressed, it is a very likely cause of flatfoot discomfort which is only partially relieved by metal supports. Obliteration of the bursa may be accomplished by an incision through the flexor digitorum brevis, care being taken to avoid the plantar artery and the lateral branch of the plantar nerve which rest upon the superior surface of this muscle, separated from it by the bursa.

If I cannot agree with Hertzler that all cases of metatarsalgia are due to bursitis I am sure that many of them can be thus explained. In some cases deep palpation on each side of the metatarsal heads will elicit the sharp pain characteristic of bursitis. In others, similar areas of tenderness may be noted just posterior to the under surface of the distal extremities of these bones. Some cases are readily cured by curettage of the irritated tissues, as Hertzler suggests. There are instances, however, where the symptoms of metatarsalgia are not accompanied by evidence of bursitis and one would hesitate to advise operation without more definite informa- of the causa vera of the disability.

Painful bursae of the adventitious type, the symptoms of which I have relieved by surgical measures, have been found just below and anterior to the malleoli, over the posterior aspect of the calcaneum below the insertion of the tendo Achillis, over the bases of the 5th metatarsal bones, over the heads of these bones on the lateral aspect, and in various situations on the dorsum of the foot where friction of a shoe or other forms of trauma have produced definite sacs with the usual symptoms of pain due to constant friction.

In my investigation of bursitis of the foot I have been impressed by the fact that in certain individuals the areolar tissue seems unusually susceptible to the formation of multiple painful bursae. In the case of a mail carrier four bursae were obliterated in one foot. The other foot was normal. In a man sixty years of age four bursae were obliterated in each foot. In the case of a waiter four bursae were obliterated in one foot and two in the opposite foot. He left the hospital entirely

comfortable but two months later was readmitted at his own request to have four other bursae operated on which were not painful when he was originally admitted. In several other cases there were multiple painful bursae and in only a few were there single lesions.

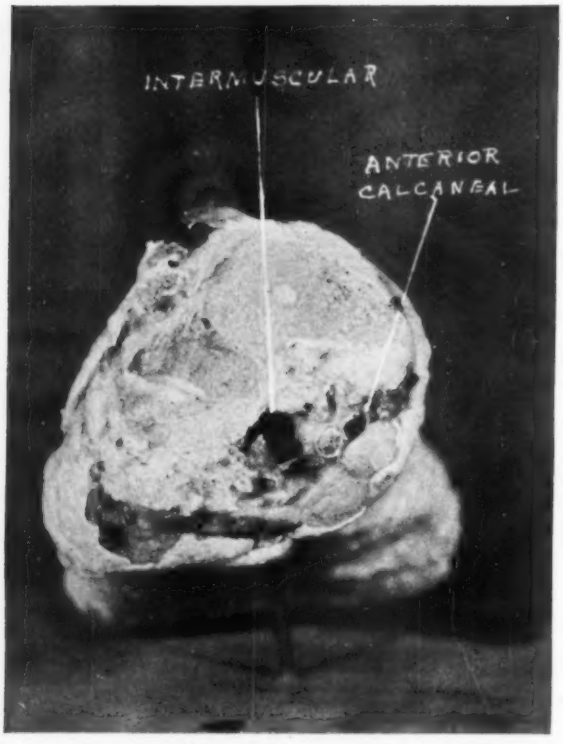

Fig. 5. Cross section of foot anterior to ankle joint showing bursa between flexor brevis digitorum and flexor accessorius muscles (intermuscular) and bursa between head of abductor hallucis muscle and tendon of long flexors (anterior calcaneal).

In conclusion let me remind you that occult bursae may form in areolar tissue wherever persistent friction creates a demand for an anti-friction medium, and that repeated trauma may produce inflammation of the bursal walls with the usual discomfort of such a condition.

Symptoms are not always confined to the area of irritation. Pain may be described as a moderate discomfort or it may be sharply acute on motion and may be referred to the longitudinal arch, the dorsum of the foot, the ankle or even the leg. It may simulate strain due to faulty statics and therefore mislead the surgeon who fails to make a painstaking examination. The diagnosis will rest chiefly upon the discovery of circumscribed areas of tenderness which cannot be otherwise explained.

Fig. 6. Metatarso-phalangeal bursae. (Spalteholz).

When the subcalcaneal, the anterior calcaneal or the metatarsophalangeal bursae are inflamed there will be no difficulty in locating the tender points and thus arriving at a diagnosis. It is possible however, to confuse the symptoms of inflammation of adventitious bursae in the superficial fascia of the sole with those of the constant sac lying between the flexor brevis digitorum and the flexor accessorius. Differentiation here will depend upon the

amount of pressure required to elicit pain and the patient's impression as to whether the discomfort is superficial or deep.

The treatment for these conditions is the same as for bursitis elsewhere. Complete rest with the compression of the affected part will frequently clear up the situation. Where such measures fail or where the time element is a factor it is more logical to obliterate the inflamed sac surgically and thus effect a permanent cure.

DISCUSSION

Dr. Harold D. Corbusier. Dr. Roberts brings up a subject which has been very much neglected, even in the anatomies. Neither Gray nor Morris gives a sufficiently full description of bursae. I operated on a case the other day removing two exostoses from the posterior aspect of the os calcis and discovered a large bursa, which I excised. The patient is doing well and walks without pain, whereas before she could not go anywhere without discomfort. I have found the bursae deep in a plantar ligament, in a case associated with flat foot; and have also found these bursae in other conditions of weak feet, not with actual flattening of the arch but with symptoms occasioned by wearing metal arches. In my opinion many of these bursae are caused by metal arch supporters which I do not use as I believe they are not necessary in the vast majority of cases. Results can be obtained with hot saline baths, massage and diathermy in the absorption of some of these bursae, but these are those about the os calcis which often require operation.

Dr. Sigmund Epstein. Since Baer wrote a paper on the subject in 1906 I have been interested in cases of painful heels. I have seen a number of them get well by simply resting in bed. But in chronically tender painful heels I have rarely seen a well formed bursa at operation. When there is a bursa the injection of alcohol is usually sufficient to obliterate the sac, but if they have to be operated on they should not receive merely superficial attention; they should be trephined in addition to curetting and removal of a disc of bone that includes the tuberosities of the os calcis.

Dr. Dexter D. Ashley. I have seen only a few bursae; I formerly always operated on them, but now I operate on very few. I believe that they are preceded by irritation and if you can remove this, nature will do a great deal to cure the patient. If the bursa is infected or there is exostosis, that is a different thing. Very often bursitis will clear up spontaneously; I know of one such case, an old man with an enormous bursa of the knee who refused operation and lived for twenty years longer during which the bursa disappeared.

Dr. Roberts (closing the discussion). It is true that painful spots might be due to irritation of the nerve. Any irritation of the areolar tissue may produce bursae the walls of which are so delicate that you cannot see them, or they may be of such dense tissue that you cannot tear them. If we remember that a bursa is nothing more than an enormously distended lymph space it is easy to understand that we can have these bursa from microscopic size up to the size of a cherry or larger. No doubt rest will cure some cases of bursitis if enough time is taken, but if you depend on rest to get rid of the symptoms you will subtract a lot of time from the patient's life, and when he gets about again the bursa may re-form. That is a common history of the metatarsal cases. Rest is very good; I have used it a number of times, but personally I think operation is the thing unless one can effect a cure in a week or so with complete rest. Dr. Epstein spoke of taking off part of the surface of the os calcis. One can do that and still not get rid of the pain. We had a case that was thought to be periostitis of the os calcis and someone had chiseled off the surface of the os calcis; the patient had subsequently been well for two weeks but after that the pain recurred. We laid back the under surface of the heel and found a bursa. I took out a section of the superficial fascia and the patient has been well ever since.

ELECTRICAL TREATMENT OF SUBDELTOID BURSITIS*

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OLDER writers have said that inflammation of the subdeltoid bursa is a very rare condition and some of them have even gone so far as to state that it is generally tuberculous. Since 1915 Brickner,[1] Fields,[2] Montgomery,[3] and Moschcowitz[4] have inquired into the true affection of the subdeltoid bursa and have published articles upon this condition. The largest number of cases was reported by Brickner.

Modern refinements in diagnosis have disclosed that there are even more cases of inflammation of the subdeltoid bursa than was generally suspected, and it is the experience of those practicing in New York hospitals that almost 50 per cent of cases of pain on motion, confined to the shoulder, are due to subdeltoid bursitis.

The diagnoses frequently made for this condition are rheumatism, arthritis, neuritis, and myositis of the shoulder. A few notes on differential diagnosis many be appropriate, and the writer will only refer to the important points without entering into details. Rheumatism may generally be ruled out because of lack of symptoms in other parts of the body. Arthritis may be differentiated by the pain being caused by all motions of the joint. Neuritis affecting only the shoulder joint has a history of direct trauma to the shoulder joint, and myositis has the same kind of history. It must be remembered, however, that some long-standing cases of bursitis are complicated by the symptoms of what is frequently called brachial neuritis. Cases of neuritis that have been successfully treated and still retain pain in the shoulder should always be suspected of being a secondary neuritis caused by a long-standing chronic bursitis.

A positive diagnosis of subdeltoid bursitis may be arrived at by a few important points. First, there is an absence of muscular spasm. Forward and backward motions of the arm are not very painful, but abduction of the arm becomes increasingly painful until the arm gets to the horizontal when it is claimed the bursa slips down into the glenoid fossa and the arm can be moved in all directions above the horizontal without pain. When, however, the arm is allowed to drop again it must go through the painful part of the arc, and the bursa is again snapped out of the shoulder joint. Another indicative physical finding is that most cases evidence great pain on internal rotation of the arm. Some orthopedic writers refer to a swelling of the shoulder immediately over the bursa; but this is really a very infrequent symptom. On the other hand, long-standing chronic cases will often show atrophy of the deltoid muscle and anesthesia of the overlying skin. It is extremely important to remember that chronic cases can exhibit a superficial anesthesia, because in administering diathermy patients may often be so insensible to the heat being applied to the skin that serious burns may result.

As regards the etiology, practically all writers are agreed that focal infection does not play any part in this condition. On the

[1] BRICKNER, W. M. Prevalent fallacies concerning subacromial bursitis, etc. *Am. J. M. Sc.*, 149: 351, 1915.
Subacromial bursitis. *J. A. M. A.*, 66: 912, 1916.
Pain in the arm: subdeltoid (subacromial) bursitis, etc. *Ibid.*, 69: 1237, 1917.

[2] FIELDS, S. O. Subacromial bursitis. *N. York M. J.*, 101: 163, 1915.

[3] MONTGOMERY, A. H. Subdeltoid bursitis associated with deposition of lime salts. *A. M. A.*, 66: 264, 1916.

[4] MOSCHCOWITZ, E. Histopathology of calcification of spinatus tendons as associated with subacromial bursitis. *Am. J. Med. Sc.*, 150: 115, 1915.

*Read before the Second International Congress of Radiology, Stockholm, Sweden, July 23–27, 1928.

other hand, all agree that the condition is always caused by trauma, either direct, indirect or thermal. Direct trauma, of course, comprises such cases as a man falling from a horse or being struck on the shoulder by some object. Experience has shown that indirect trauma, such as carrying a heavy object for a long time and excessive, unusual exercise of the arm, has caused some cases. But in the cases upon which this paper is based, by far the greatest number of patients have noted an onset of symptoms after a thermal trauma, such as exposure to cold. Infected bursae have been mentioned by some authors but none has ever been described.

The symptom that patients complain of is usually inability to lie on the shoulder or on the opposite shoulder. They notice pain on all lateral motions except when the arm is raised by being brought across the chest to the horizontal. They are then able to use the hand to fix the hair and to make such motions above the shoulder. They also prefer to support the arm against the chest, taking the pull of its weight off the shoulder. The only comfortable position at night is lying on the back with a small pillow raising the shoulder. It is a very constant unexplained symptom amongst patients with this condition that they have pain just below the deltoid insertion and also on the extensor surface of the wrist. If the condition is of a few weeks' duration, the patient may also have pain in the scapular region due to a general spasm of the shoulder muscles.

When chronic cases come for treatment and it is deemed necessary to confirm the diagnosis by roentgen ray, it is of extreme importance that the patients be sent to a first-class roentgen-ray laboratory. Many cases of calcification in the region of the bursa are missed when the roentgenologist is not sufficiently experienced to get the arm in the correct position to assure disclosure of calcification. External rotation of the arm during roentgen-ray examination is necessary to reveal calcification.

The treatment of these conditions covers almost every conceivable idea about them. There are ardent believers in certain methods which are as ardently opposed by others interested in the treatment of bursitis. It should be stated that massage is useless, while exercise is helpful only to a very slight extent. Stretching of the joint is extremely painful and cannot be relied upon to produce any certain help. In most cases immobilization is not necessary. In the writer's opinion only cases of acute bursitis superimposed upon a known chronic bursitis with calcification require immobilization. Real acute cases are made comfortable by carrying the arm in a sling whereby the weight of the arm is lifted from the joint. This procedure, however, is merely for the patient's comfort and of no actual therapeutic value. Brickner has devised a very clever and efficient method of controlling the movements of the arm by fastening the elbow to the head of a bed with a towel; the patient being raised on pillows, as he gradually slips from the pillows, this procedure compels a painless abduction of the arm without causing acute muscular spasm. Until recently the only treatment for chronic subdeltoid bursitis, where calcification is revealed by roentgen-ray examination, has been an operation for the removal of the bursa. Some writers state that actual removal is impossible, while others think it is not a difficult operation. Nevertheless, operative treatment results in a disfiguring scar. The only cases in our experience in which operative treatment was preferable were those old chronic cases with an acute exacerbation. Within the past year, however, it has been found that complete immobility of the arm with the treatment described below has relieved patients of all pain and also brought about absorption of the calcification.

Before going into this particular electrical treatment, it is but fair to state that it has been actually noted that when roentgen film has been made of a shoulder which showed calcification, there has been a distinct relief of symptoms, undoubtedly

due to the roentgen ray passing through the shoulder. It has been claimed that some cases will clear up entirely, even those with

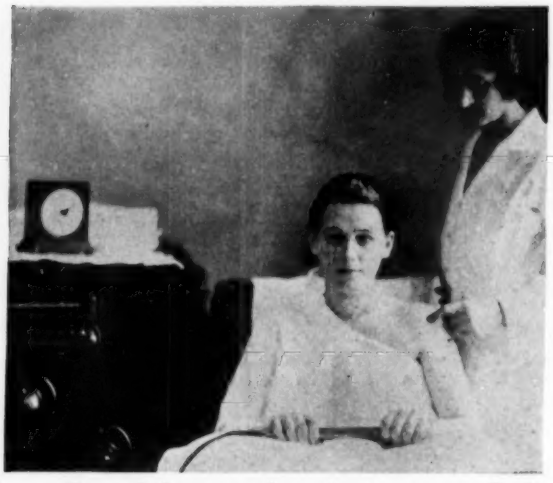

Fig. 1. Grounded autocondensation treatment. Patient sitting on autocondensation pad and connected in ordinary way. Operator grounds high-frequency current through her finger.

calcification, after being exposed to the roentgen alone. None of these cases has been actually reported but all writers claim to have seen this result.

Electricity as a means of treating these cases has been used for a number of years, and it must be admitted with somewhat unsuccessful results. Galvanism is still recommended by a few old-fashioned writers, who still believe that a galvanic current can affect tissues lying as deep as the subdeltoid bursa. Since the use of high-frequency electricity as diathermy has been recognized as a rational procedure, many have attempted to treat the subdeltoid bursa with diathermy, but the usual technique of placing an electrode in front and behind the shoulder joint has done nothing more than heat up that part of the body without producing any actual affect upon the subdeltoid bursa. Nagelschmidt recommends placing a small electrode over the bursa and a large one in the opposite axilla, but the size of this small electrode so limits the amount of current that can be given that the effects, if any, are quite negligible.

In 1922 the writer had for treatment a particularly stubborn case with calcification for over three and a half years and almost entire immobility of the shoulder

Fig. 2. Static effluve treatment.

joint. The technique was evolved of placing the patient on an autocondensation pad and administering high-frequency electricity of such quantity that the meter read about 900 ma. This patient was anesthetic over the bursa and could not detect the heat when too great. The writer therefore decided that the best guide to dosage was to place his own finger over the bursa and ground the high-frequency current through the operator's finger. This was done and immediately the effect of this concentrated flow of high-frequency electricity through the small area covered by the finger directly over the bursa produced remarkable results. This technique was described in a series of case reports in 1922. It must not be supposed, however, that diathermy alone will cause the rapid disappearance of calcification or decrease all symptoms in acute cases.

Cooperman published a report of 12 cases which were treated with diathermy, medicinal means and immobilization with later passive manipulation, but his results were obtained very slowly.

Diathermy, we have reason to believe, creates congestion in the part to which it is administered, and this should never be considered sufficient treatment. It has never been proved that medication has any effect at all on these cases except to dull the

pain when appropriate drugs are used. Manipulation and stretching can have little, if any, effect upon these bursae which, lying upon the supraspinatus tendon, are only slightly affected by muscular motion. To increase the effectiveness of diathermy, it is quite necessary to use such a modality as static electricity, which, due to its decongesting action, will forcibly promote absorption of the fluid in an acute bursa and also promote absorption of calcification when present as a complication of chronic bursitis.

Brickner undoubtedly is correct (although all other writers on this subject do not agree with him) that the calcification is not in the bursa nor in the entire wall of the bursa, but lies more in the tendon of the supraspinatus muscle under the floor of the bursa. Nobody has ever reported finding actual salts of calcium in the bursa itself. Therefore, calcification is an associated condition undoubtedly brought about by the body as a means of protecting the tendon of the supraspinatus muscle from interference with its function because of the chronically inflamed bursa lying above it. It does not take long for calcification to form, for in the series of cases treated by the writer one patient had an indirect trauma to the bursa five days before a roentgenogram was taken, when the calcification was revealed. This patient, a college professor who could be relied upon for his history, was positive that he had never had any trouble in that shoulder before. Inside of three weeks all calcification was absorbed, and, we hope, due to the treatment.

In conclusion, it can be stated from a personal experience with over 150 such cases, that the combination of general heat to the shoulder, as from an incandescent lamp, to increase the efficiency of the high frequency-current which is next administered as "grounded auto-condensation" and then followed by the application of the static current as an effluve, can be relied upon to relieve all forms of bursitis, either acute or chronic. Admitting that spontaneous absorption of calcification can take place, this method of treatment can also be relied upon to bring about an absorption of calcification in the region of the bursa.

CARTILAGE INJURIES

A CLINICAL STUDY*

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NEW YORK

IN the July issue of the Journal of Bone and Joint Surgery for the Year 1926, under the title "Introductory Considerations," a few of the more practical anatomical, chemical and pathological aspects of cartilage injuries were considered. Following that discussion a few of the more frequent conditions involving cartilage may now be discussed. In the article mentioned this study was extended to include the fingers and wrist.

THE ELBOW

Inasmuch as there are no fibrocartilaginous structures within the elbow it would seem, at first thought, that this articulation should be omitted in a discussion dealing with injuries to cartilage. On the contrary, it is in this very location that we have our best opportunity for studying the early production of cartilage and the formation of bony proliferations. Most or at least many of our bad end-results in the treatment of fractures in or about the elbow joint are due to these bony overproductions, and at the onset we are confronted with two questions:

1. How and why do they develop?
2. Can we stop their development?

DEVELOPMENT

In answer to the first question we have many theoretical replies:

The simplest of these is that there exist within the anterior capsule of the joint certain cartilage cells. These cells are not fully developed and therefore when disturbed or traumatized they begin to proliferate. In this connection Key, writing of synovial membrane, has divided the structure into three types: areolar, fibrous and adipose. In discussing the fibrous type, he says, "I am inclined to regard these encapsulated cells as cartilage or transition stages between synovial membrane and cartilage cells."[1] We must admit that cartilage is, in reality, closely related to connective tissue and that it can be easily reproduced from a common connective-tissue matrix. Therefore, we cannot be satisfied with such a simple explanation.

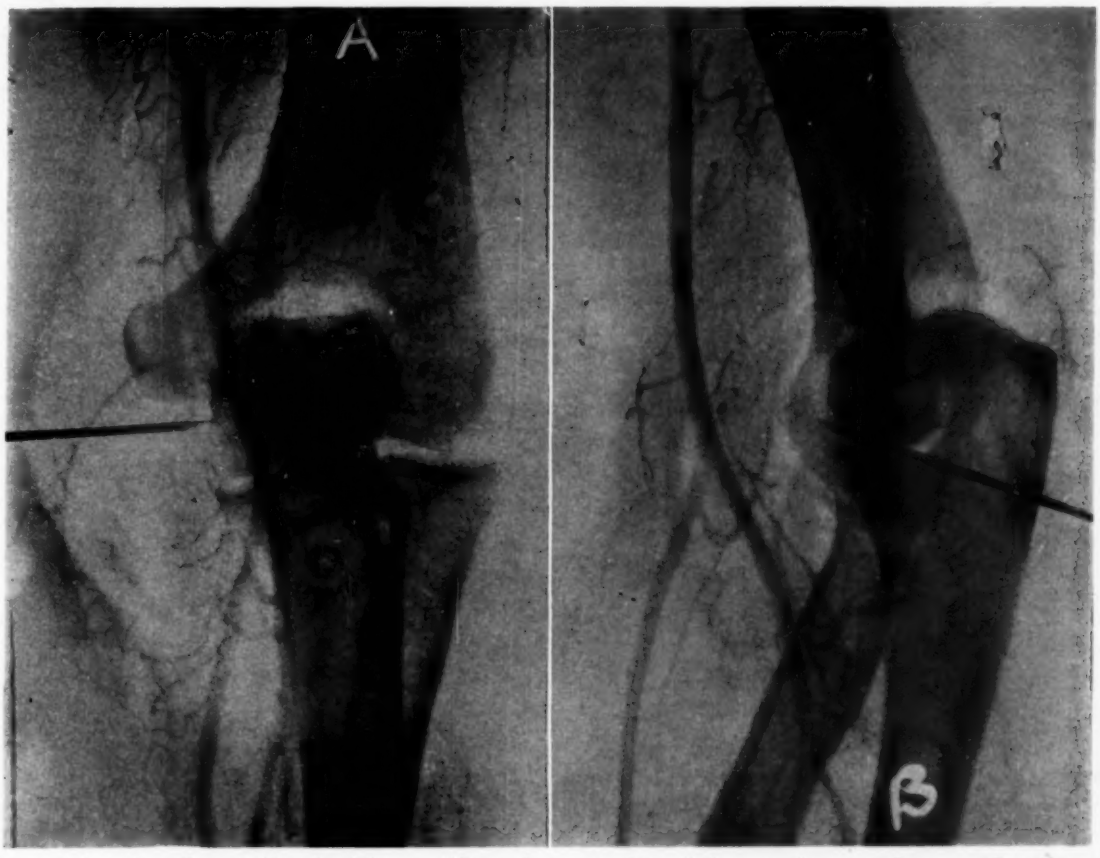
As proof of the fact that these cartilaginous and bony masses are not from the periosteum or bone, but accrue within the capsule, permit me to refer to a case shown at the Academy of Medicine by the Department of Traumatic Surgery of the New York Post-Graduate Hospital in connection with a review of 150 fractures in or about the elbow. The mass shown was about 2 cm. in diameter and freely movable. Later it became attached to the ulna and humerus.[2]

The next theory is that these overgrowths of cartilage are entirely due to a circulatory phenomenon. Figure 1 clearly shows that the main arterial supply to this area turns sharply backward. An infusion within the articulation or a swelling of the soft parts about the joint certainly would impair the circulation through such a vessel.

Recently Professor Rene Leriche of France has written of his experimental work in this connection.[3] He has severed the sympathetic nerves governing the vessels and claims in this manner to have lessened the production of the synovial fluid. He described a condition of *traumatic arthritis*, claiming: "In ten days following an injury the cartilage, in part, is destroyed." He states: "Bony rarefaction accompanies hyperemia and results in a bad effect on the nutrition of the cartilage

* Submitted for publication, December 10, 1928.

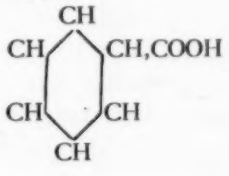
which results in pain and functional disability." (This article, to me, is one of the best on the subject and should be carefully read by those deeply interested in joint pathology.) Granting that the circulation does play a very important part in cartilage production, the theory offered by Wollenberg, that cartilage cells require little nourishment and proliferate when the circulation to other tissue near them has been impaired, would seem to substantiate the circulatory theory that a diminution in the blood supply is responsible for such a condition.



Figs. 1A and B. An elbow inflated with gas. Note the extension of the anterior capsule upward a distance of about 2 in. Also note the recurrent artery which supplies this area. (The wide lateral expansion is due to a faulty technique) . . . Note the small amount of blood vessels in the region of the external surface and in the area about the head of the radius.

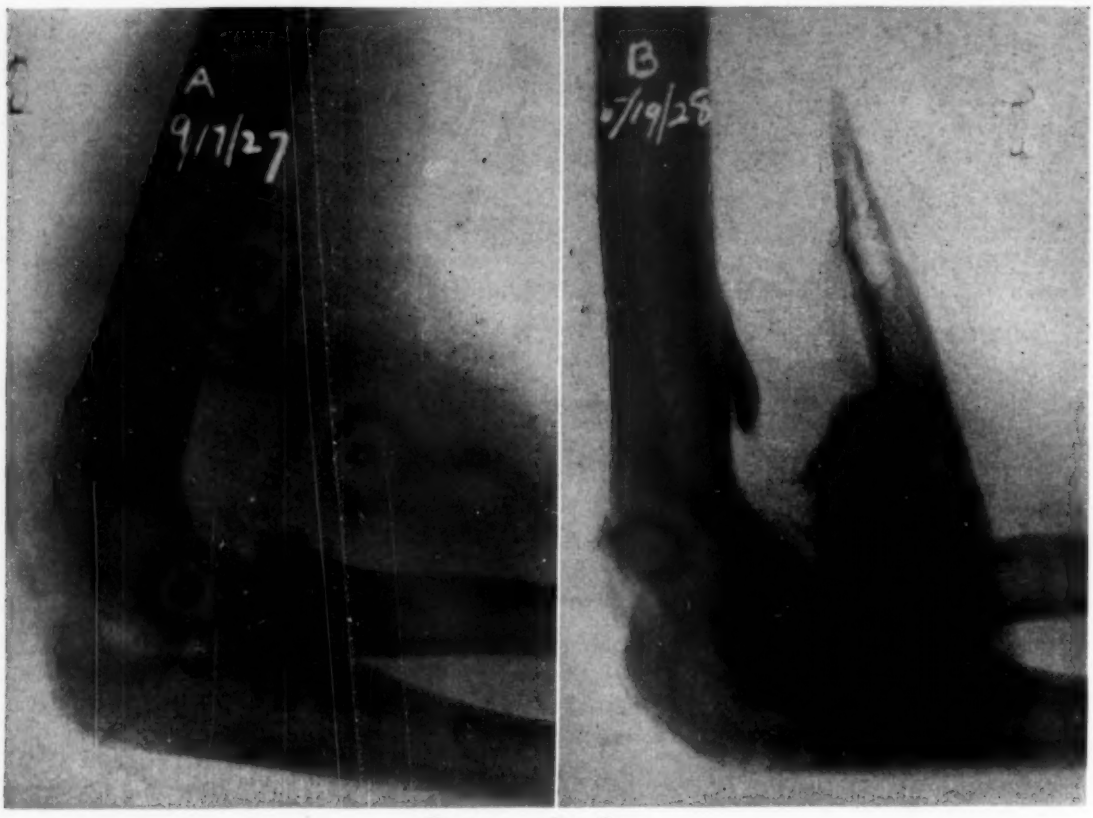
Next we come to a still more theoretical consideration which seems to me to reach nearer to the depths of the discussion, that is, the chemical changes. We know that in certain diseases such as gout, purin bodies are found deposited in or near joints. Is there a chemical affinity of the cartilage for these bodies? Likewise in alkaptonuria, for example, areas of cartilage are affected.* We have no evidence that lack or excess of calcium or phosphorus is responsible for the condition, and must return to the theory advanced by me in the preceding papers: *The cartilage is rich in sulphuric acid.*[4] *Therefore is it not a fault in the sulphur metabolism, which is the true cause of cartilaginous over-production?* As an indication of this, do we not know that for years sulphur baths have been thought to be beneficial in joint conditions? It is known that cystein (amino-acid) assists in metaboliz-

* Formula for alkapton:



ing sulphur, and thus intestinal stasis can be connected with a fault in sulphur metabolism. Hahrminann, years ago, noted

there been any symptoms to indicate a general or distant focal infection. One of the cases (Fig. 2) was in a young man with



Figs. 2A and B. Case I.

in his work on severe chronic arthritis, the fact that when what he calls high potany sulphur, was given his other medications seemed to be more effectual.

Miss A. B. Baylis,[5] in working with blood serum with lead acetate and lead sugar as reagents, noted in cases of severe arthritis that a heavy precipitate interfered with her reactions. This was thought to be caused by sulphur compound but proved to be a protein substance. (This work will be reported by me in a later paper.)

Finally must we add to the already complicated considerations a bacterial logical invasion. In dealing with acute traumatic lesions I have found no evidence to indicate that an acute or chronic infection is, in part, responsible for the condition. None of the cases has shown local reactions to indicate a pyogenic infection, nor have incipient tuberculosis, but I do not consider that the tubercular lesion was a factor in the production of this huge proliferation.

Case I (Figs. 2A and B). H. S., aged sixteen, came to Post-Graduate Hospital three weeks following a fall on the elbow, received while playing tennis. On September 22 a careful manipulation was done. He has failed to return for operation.

Numbers of cases have been seen in which the individuals were apparently in perfect physical condition. It might be said that the age seems to play only a small part inasmuch as the condition was encountered frequently in children, but also seen after forty-five.

Case II (Figs. 3 A, B and C). B. D., a robust woman of forty-two, slipped and fell upon the street February 7, 1928. She was

taken at once to a nearby surgeon who claims to have reduced a dislocated elbow. Two days later, she came to the Post-Graduate Hospital.

Fig. 3A. Case II.

On February 9 she was operated upon for a fracture of the neck of the radius. A complete removal of the radial head was done. Note the extensive proliferation of cartilage and bone in B. We hope to gain the patient's consent for a second operation in the near future.

I am of the opinion that in those over fifty the condition seems less likely to appear, but to my mind this again reverts us to the chemical theory. Could it be that a lack of sulphur prevents these overgrowths in individuals who have entered the period of life's decline? If so, can we not reason that the giving of sulphur to such individuals would assist in the production of cartilage and thus be indicated on occasions where we have a delay in the union of fractures?

PREVENTION

Let us begin with the more practical mechanical and physical considerations.

Whenever I see a case in which there is limitation of motion due to excessive cartilage and bony production, and have

Fig. 3B. Case II.

in mind doing a manipulation under anesthesia to push away, as it were, the tissues blocking the joint movements, I stop and ask myself, "Am I right?" It is difficult to form an answer. At least, I have not thoughtlessly undertaken these procedures. By manipulation, shall I not stir up the cells to increased activity? On the other hand, will the patient be content to allow his joint to become less and less useful, and also permit his muscles to lose

their power? Would it not be well, therefore, to undertake a single careful manipulation?

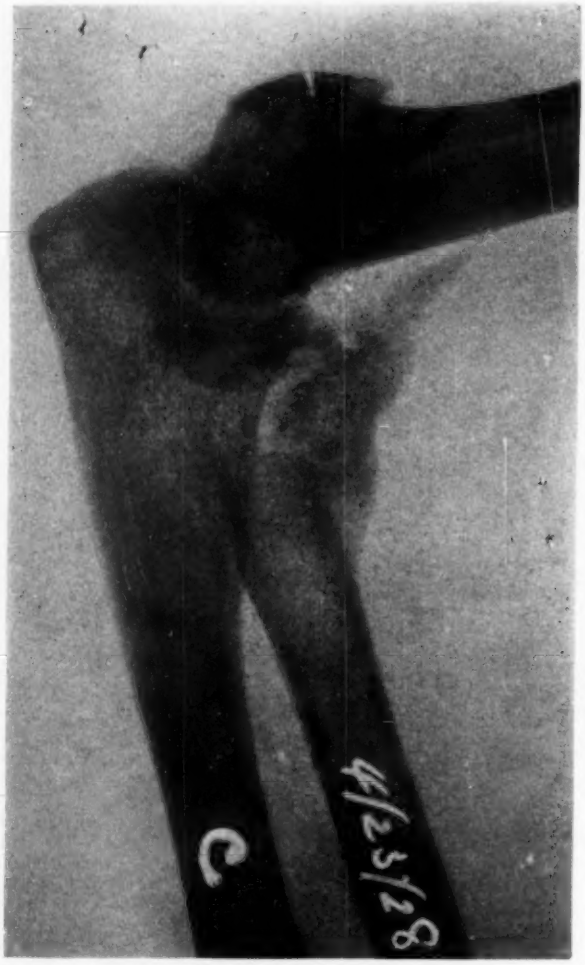


Fig. 3c. Case 11.

Even before this, in an acute case, will one, by rough handling of the joint, cause a proliferation of cartilage which would not have otherwise appeared? Should wet dressings be used to assist in an early reduction of the swelling? I am in favor of immediate reductions of fractures; but where a joint is concerned, could we afford to revert to the older theory of waiting a short time? There is no argument that in all elbow fractures the acute flexed position advocated by Sir Robert Jones is an ideal procedure (the only exception being a fracture of the olecranon).

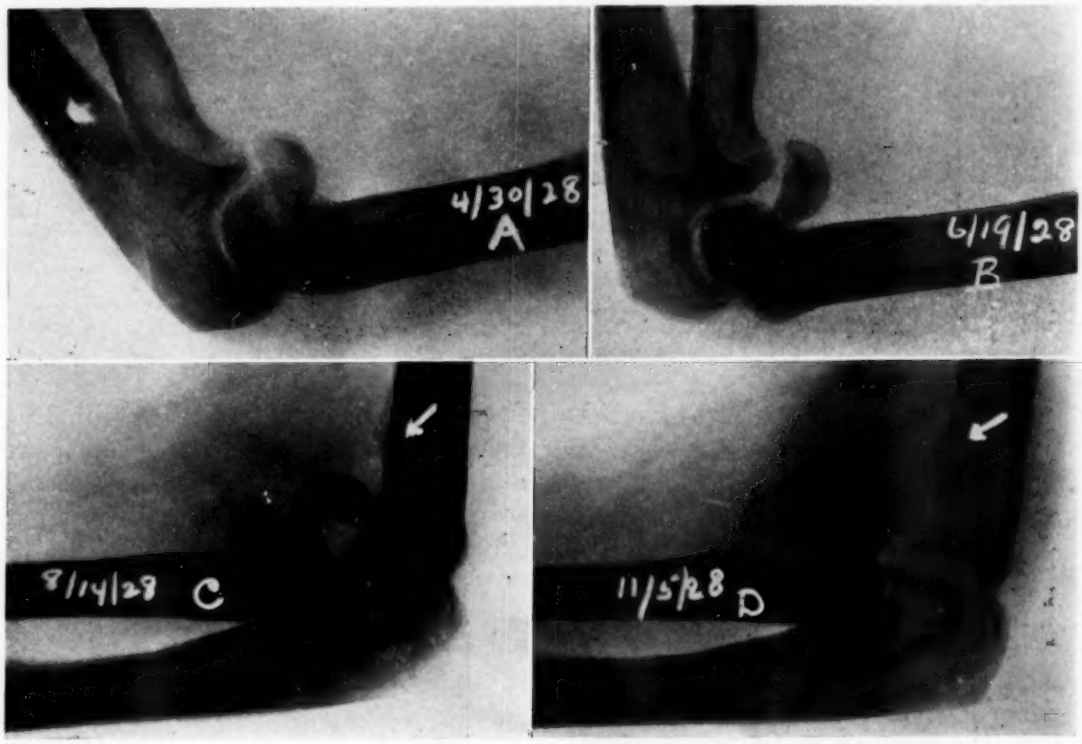
In knee conditions where there has been an effusion into the joint with or without hemorrhage, we advise aspiration; but in the elbow I have no knowledge that this treatment has been extensively carried out. Such an aspiration would relieve the pressure upon the anterior capsule and permit freer circulation of the blood in the recurrent artery supplying this area.

My experience has not been extensive enough to discuss any of the above mechanical considerations with a positive degree of certainty. If those treating such lesions would assist in the collection of data, we might arrive at a more definite conclusion in regard to the advisability of doing an immediate aspiration of the elbow joint.

Turning to physical considerations, what will heat do? It will increase the flow of blood. But it will, at the same time, increase the effusion within the joint, a thing not to be desired. Will not heat rouse the cartilage cells to more active proliferation? Therefore, is it not wrong to send such an elbow case for early baking or other methods directed along the same lines? In order that this discussion may not appear too theoretical, permit me to quote Dr. H. Halsted, who, in connection with industrial work, has reviewed the final end-results in more than 200 fracture cases in and about joints, and states that in his opinion, heat is strongly contraindicated, except in conditions of very long standing. With this I agree, and have come to believe that baking should be, at least for the first few weeks, omitted.

What will massage do? Again we must reply, "It will improve the circulation." But will it not cause an excessive growth, just as in the application of heat? Will it not disturb the existing cartilage cells to further proliferation? Can we then satisfy our patients by convincing them that it is a better policy to omit the usual treatments, such as massage, baking, etc? Figure 4 is an illustration of a case which was, let me say, "handled with gloves." By this is meant that early motion was begun by the patient, after five days of immobilization in the Jones acutely flexed

position. Active motion was encouraged up to the point of causing pain but too passive motions were carried out. This



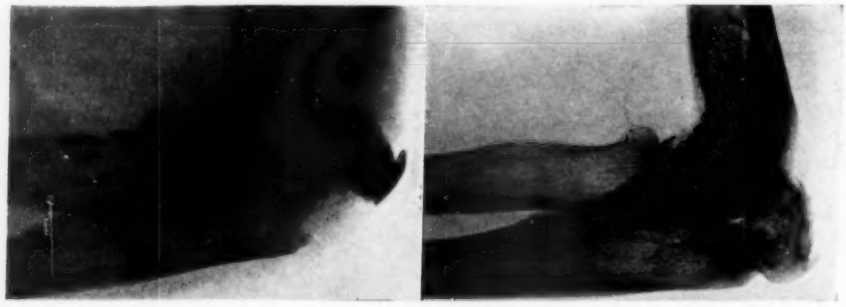
Figs. 4A, B, C and D. Case III.

early motion is most beneficial in reducing the amount of joint effusion. As stated by Dr. Moorhead in discussing knee-joint injuries "There is no joint in the body in which active motion is more indicated, and none in which absorption of effusion is more quickly influenced by circulatory stimulation, than afforded by *self-massage*, induced by the patients' own action."[7]

Case III (Figs. 4 A, B, C and D). L. B., a young lady, aged sixteen in most excellent physical condition, came to the Post-Graduate Hospital after having slipped and fallen down a flight of stairs, landing upon her elbow. For two days she entirely disregarded the injury. Upon admission, there was limitation in flexion beyond a right angle and on May 1, 1928 a *very careful* manipulation was done under gas oxygen anesthesia. The arm was put up in acute flexion with a Jones dressing applied. This case was most carefully observed. She refused operation for removal of the fragment, because of the scarring deformity following it. No baking or external heat was used and no massage given in the immediate location of the joint. Note that with such treatment there was no appearance of cartilage or bony proliferation for a period of *nearly four months* (a much longer time than is usually required in cases treated by baking, frequent manipulation and vigorous massage at the fracture site). At the date of the first appearance of this proliferation she was treated with a large penetrating dose of roentgen rays. Less than three months later the process, instead of increasing had if anything diminished, in spite of the fact that there was a foreign body within the joint to keep up an irritation of the anterior capsular area.

As a similar example of a case where massage and baking were omitted, I recall seeing a child, four weeks after a most severe fracture into the elbow joint, playing about her home with a perfectly functioning elbow. Because of the discouraging roentgenograms, I was asked by the attending physician to see the case. There has never been any obstruction due to excessive cartilage production following this untreated fracture.

After an organized bony bridge has formed, what will be accomplished by an open surgical operation for its removal?



A B

Figs. 5A and B. Case IV.

What will be the best time to undertake such an operation? I am of the opinion that six months or a year should be allowed to elapse, for thus a second proliferation would be less likely to develop, necessitating a second operation.

Finally, as an illustration of a severe damage to the elbow in the aged:

Case IV (Figs. 5 A and B). M. Mc., an aged lady with a blood pressure of 220, was struck by an automobile on April 15, 1928. I operated under local anesthesia the following day. The joint was, of course, filled with a mass of blood clot which was removed. The ulnar shaft and fragment were drilled and tied with kangaroo tendon. Six months have passed and no proliferation which could be clinically detected, has so far been noted.

Fig. 6. Roentgenographic aspect of an acutely distended bursa injected with sodium bromide prior to removal.

Fig. 7. External appearance of bursa, with line of incision indicated.

On discussing the means of preventing these conditions let us again revert to chemical theory. Should we restrict the sulphur intake? In lecturing upon arthritis I have tried to stimulate medical students

to test this theory as it applies, for example, to cases of hypertrophic osteoarthritis where excessive cartilagenous production plays a part in the joint condition.

Finally, can we prevent the proliferation of cartilage by means of roentgen-ray treatments? Professor Wm. H. Meyers of the New York Post-Graduate Hospital, although he does not offer great encouragement, has consented to cooperate with me in an attempt to destroy these cartilage productions. We have, however, treated only 2 cases and cannot, therefore, draw any conclusions as to the end-results obtainable from this procedure. In the cases treated it has been beneficial.

OLECRANON BURSITIS

In discussing cartilage injuries about the elbow it may be wise to discuss briefly our findings in 19 cases of olecranon bursitis reported by Dr. Mathewson and myself. We noted that untreated cases are likely to develop an osteomyelitis of the ulna at the attachment of the bursa to this bone and that it was a wise procedure to remove these bursae completely rather than attempt other methods of treatment. From Figure 6 you will note that this structure is nearly 2 in. in length and cannot be removed without an adequate incision such as is illustrated in Figure 7. Following removal the area of attachment should be carbolized and the wound closed without drainage. The disability period in cases treated early is usually not more than two weeks, but in neglected cases where a low-grade osteomyelitis has developed, there is often a disability period extending over many months.[6]

CONCLUSIONS

1. Fractures into joints require special attention.
2. Sulphur metabolism may be an important factor in cartilaginous conditions.
3. Early aspiration is often indicated.
4. Early active motion is most desirable.
5. Wet dressings are frequently beneficial.
6. Baking may be contraindicated.
7. Operative interference should be delayed after proliferation has begun.
8. Roentgenograms may prove of therapeutic value.

REFERENCES

1. Key, J. A. Special Cytology. N. Y., Paul B. Hoeber Inc., 1928, Vol. II, 741.
2. Ritter, H. H. et al. *J. A. M. A.*, 86: 680, 1926.
3. Leriche, R. *J. Bone & Joint Surg.*, 10: 492, 1928.
4. Lasher, W. W. *J. Bone & Joint Surg.*, 8: 651, 1926.
5. Baylis, A. B. Personal communication.
6. Lasher, W. W. and Mathewson, L. M. *J. A. M. A.*, 90: 1030, 1928.
7. Moorehead, J. J. Knee-joint injuries. *Atlantic M. J.*, 31: 547, 1928.

SEMILUNAR CARTILAGE CYSTS*

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CYSTS arising in the semilunar cartilages of the knee joint are rarely observed, only 26 cases having been reported since the lesion was first described by Ebner in 1904. The sequence in which the previous observations have been recorded is shown in the chart, Figure 1.

The purpose of this article is to present 10 cases; 1 of these, (Case II), has been reported in a former publication. The clinical manifestations illustrate the cardinal symptoms of this unusual condition, and in 7 cases the diagnosis has been confirmed by excision of the cartilage and the pathological changes have been noted.

HISTORICAL SUMMARY

			External Cartilage	Internal Cartilage	Male	Female
Ebner.....	1904	First described cyst	1	..	1	
Schmidt.....	1906	Reported 1 case	1	..	1	
Eden.....	1911	Reported 1 case	1	..	1	
Riedel.....	1914	Reported 6 cases	6	..	5	1
Ollerenshaw	1921	Reported 3 cases, referred to 2 cases seen by Furnivall	5	..	5	
Phemister...	1923	Reported 2 cases	2	..	1	1
Fisher.....	1924	Reported first case of internal cartilage. Referred to case seen by Furnivall	..	1	1	
Jean.....	1924	Reported 3 cases	3	..	3	
Allison and O'Connor	1924	Reported 2 cases of external cartilage and also 1 case of internal cartilage	2	1	1	2
Campbell...	1924	Reported 1 case	1	..	1	
Kleinberg...	1927	Reported 1 case	1	..	1	
Zadek and Jaffe.....	1927	Reported 1 case	..	1	1	

CASE REPORTS

CASE I. A male, aged thirty-five, a teamster by occupation, was examined on November 18, 1921. For about five years the left knee had been painful. The symptoms has never been severe until two years before, at which time he had an acute attack of "rheumatism" in the knee, which confined him to bed for six weeks. Since that time the pain had been more or less continuous and motion was limited.

There was a rounded mass 1 in. in diameter on the inner aspect of the internal tuberosity of the tibia. Motion of the knee was free, without crepitus, but he could not fully extend nor completely flex the joint. The roentgenogram showed a slight increase of the joint space on the medial side and a shadow resembling soft callus on the inner aspect. The Wassermann test was negative.

On November 22, 1921, the internal semilunar cartilage was excised. A cystic mass was found attached to and growing from the internal semilunar cartilage. The cartilage was detached posteriorly and protruded slightly outside the joint. The cyst was filled with clear gelatinous material, and the interior of the cartilage was partially calcified. The result was excellent.

CASE II. A boy, aged five, was seen on October 23, 1922, complaining of a limp and a swelling in the right knee which had been noticed three weeks previously. Examination revealed a rounded mass about 1 in. in diameter on the external surface of the right knee. Flexion of the joint was normal, but extension was limited at 160°. The roentgenogram was negative and the Wassermann test was negative.

An incision was made over the lateral aspect of the knee joint. A rounded mass was found arising from the external semilunar cartilage. The tumor including the cartilage was easily removed, and when excised, exhibited an

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encapsulated multilocular cyst with clear viscid fluid contents. The recovery was uneventful.

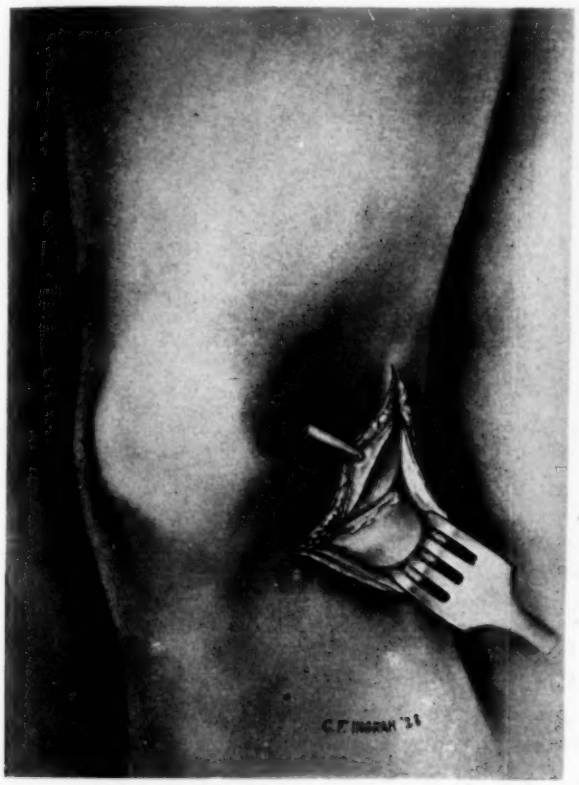

Fig. 1. Drawing showing operative exposure of cyst of external semilunar cartilage.

Case III. A woman, aged forty-four, the wife of a physician, was examined on July 9, 1925. At intervals for one year she had been conscious of a dull aching pain in the right knee. Seven months before the examination an enlargement was noticed on the outer side of the knee. During the few weeks previous to examination the ache had been continuous with frequent shooting pains from the hip to the ankle and the growth had seemed to be more rapid. There was no history of injury.

Motion of the knee joint was normal, but was accompanied by a mild rubbery crepitus. The circumference of the knee joint was ¼ in. greater than that of the opposite knee, and there was an enlargement just above the head of the fibula which was firm and tender on pressure. The roentgenogram showed an area of increased density in the soft tissues at the outer margin of the right knee joint. The bones were normal. The Wassermann test was negative.

An incision was made on the lateral surface of the knee. The joint capsule was opened and the external semilunar cartilage was found enlarged with a cyst containing clear gelatinous

Fig. 2. Fig. 3.

Fig. 2. Photograph of specimen from Case x, showing location of cyst in middle third of cartilage.

Fig. 3. Cross section of tumor and cartilage showing multiple spaces separated by thin-walled septa.

material. The joint was otherwise normal in appearance. The cartilage was excised and the patient made an uneventful recovery.

Case IV. A nurse, aged twenty-two, was examined in January, 1925. Three years before, while on duty in the operating room, she had noticed pain and aching on the outer side of the left knee. The pain was originally felt during the menstrual period, and for several months recurred with the menstrual cycle, the attacks lasting four or six days. Shortly before the examination a nodule ½ in. in diameter appeared on the lateral aspect of the knee. This swelling was directly over the external semilunar cartilage and was tender on pressure. At that time a diagnosis of cyst of the cartilage was made and an exploratory operation advised. Within a week, however, the mass disappeared spontaneously, and the operation was, therefore, postponed. During the following year the pain gradually increased, each succeeding attack being of longer duration and of greater severity, and the intervals between the attacks of shorter duration until the pain was almost constant while the patient was on her feet. The sensation, according to the patient, was that of a foreign body in the outer portion of the joint.

Reexamination in January, 1926 showed no abnormality in the contour of the knee. There was no effusion. The range of motion was normal without crepitation but full extension caused pain on the outer side of the knee. The

cartilage was not visibly enlarged but on palpation a definite mass could be detected which seemed to be attached to the external semilunar cartilage, and which was tender on pressure. The blood Wassermann was negative and roentgenograms of both knees were negative.

A provisional diagnosis of internal derangement of the knee, possibly a cyst of the cartilage, was made, and on March 2, 1926 the joint was explored through a lateral incision. The external semilunar cartilage was found to be enlarged and contained a small cyst at the peripheral border of its middle third. The anterior $\frac{3}{5}$ of the cartilage was removed with complete relief of symptoms.

Case v. A Russian fruit-dealer, aged forty, was examined on December 5, 1925. For several years he had been subject to recurrent attacks of pain and swelling of the left knee. There was no history of trauma, but these attacks were always more severe during cold weather. The preceding day had been the occasion of the most acute attack he had ever experienced and for twenty-four hours he had been scarcely able to walk because of pain.

Examination revealed a firm circumscribed swelling 1 in. in diameter just lateral to the patella tendon, apparently fixed to the tibia. The mass was tender to pressure and all movements were painful, especially full extension. Roentgenograms of both knees showed no bone pathology, but an area of slightly increased density was seen within the joint space of the left knee in the region of the external semilunar cartilage. The blood Wassermann test was negative. A diagnosis of cyst of the external cartilage was made, and excision advised. The patient would not submit to this and he has since been lost from observation.

Fig. 4. Photomicrograph of a large section of the tumor. Low power. Shows border of a large cyst and two smaller adjacent cysts.

Fig. 5. Photomicrograph showing blood vessels in perichondrium with greatly thickened walls.

Case vi. A salesman, aged thirty-five, was examined on December 29, 1925. One week before he had struck the outer side of his right knee against an automobile door. The injury was not severe, there being no subsequent ecchymosis, but the immediate pain was intense and persisted for two days, causing a pronounced lump. He had also noticed stiffness of the knee on arising.

Examination showed a slightly rounded protuberance on the outer aspect of the right knee, anterior to the biceps tendon and on a level with the lower extremity of the patella. The tumor was about $\frac{3}{4}$ in. in diameter, tender on palpation, and apparently contained fluid under tension. The range of motion of the knee was normal. Roentgenograms of both knees were negative, and the Wassermann reaction was negative.

The cyst was aspirated and $1\frac{1}{2}$ c.c. of clear gelatinous fluid withdrawn. The tumor immediately disappeared, the symptoms subsided, and to date there has been no recurrence. Culture of the aspirated fluid was negative.

Case VII. A school boy, aged eighteen, was examined in July, 1927. Following a minor injury in a football game eight months previously, he had noticed a painful area on the outer side of the right knee. A slight swelling was present, and at times a light tap over the head of the fibula caused a tingling sensation in the lower leg.

Examination showed an enlargement, which was tender to pressure, just anterior to the head of the fibula. Motion of the joint was free throughout the normal range. Crepitation was present in both knees, more marked in the right. The Wassermann reaction was negative, and roentgenograms of the right knee were negative.

A diagnosis of cyst of the external semilunar cartilage was made, and on July 12, 1927 the joint was explored through a lateral incision. A cyst was found attached to the peripheral border of the middle third of the external semilunar cartilage. The entire cartilage including the cyst was excised. Grossly, the specimen consisted of the semilunar cartilage on the outer side of which was a large thin-walled cyst separated into several loculi and containing a greyish pink mucoid material. There has been no recurrence of the tumor, but the knee is swollen and painful in damp weather.

Case VIII. A farmer, aged forty-two was examined on November 7, 1927. For five years there had been a small tumor mass on the outer surface of the right knee, just above the head of the fibula. This swelling had formed gradually, without antecedent injury, and had caused no inconvenience except an occasional slight pain. A few hours before admission to this clinic, while catching mules, he twisted his knee. There was immediate pain radiating from the mass through the knee joint, so severe that walking was impossible and opiates were required for relief.

The examination showed a firm rounded swelling of the size of a walnut, on the lateral surface of the right knee. The mass was directly overlying the external semilunar cartilage, was tense and cystic in consistency and tender on pressure. There was a slight increase of synovial fluid within the joint. Motion of the knee was normal. Extension of the knee caused the mass to become more prominent; flexion caused the mass to be less prominent. Roentgenograms of both knees were negative, and the Wassermann was negative.

On the following day the knee was explored through a lateral incision. A large multilocular cyst, containing a clear jelly-like substance

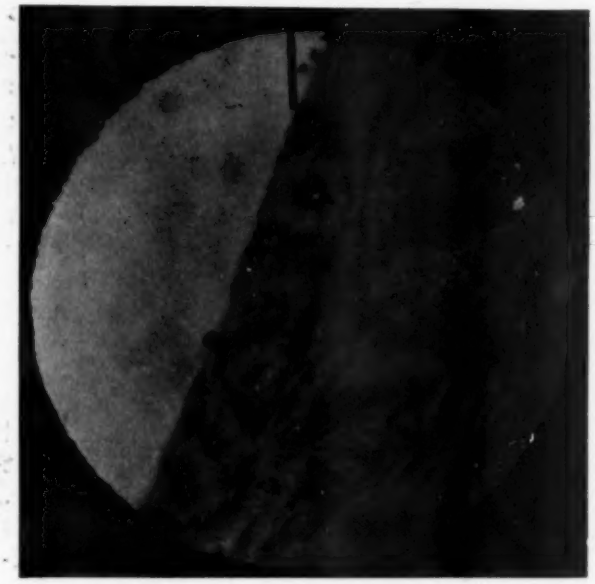

Fig. 6. Photomicrograph, high power, showing wall of one of the large cysts containing irregularly spaced cells with flattened nuclei.

was found arising from the mid-portion of the external semilunar cartilage. The cyst was in close relation to the synovial membrane and apparently had protruded through the membrane at a point close to the posterior attachment of the cartilage. The entire cartilage was removed with complete relief of symptoms.

Case IX. A boy, aged eleven, was examined on April 7, 1928. For the previous two years he had suffered recurrent attacks of pain in the left knee. There was no history of injury, nor could the boy designate any factor which would precipitate an attack. When pain was present, however, walking aggravated it. The attacks lasted one or two days, were afebrile, and in the intervals the child seemed perfectly normal. The day before the examination, while running, the knee had locked and he had been temporarily unable to straighten it. Later the locking disappeared and at the time of the examination there was no disability.

Examination revealed a thickening which was tender on palpation 1 in. lateral to the lower border of the patella and along the joint margin. There was no limitation of motion of the knee. The blood Wassermann was negative. The roentgenogram showed a circumscribed

area of increased density in the soft tissues in the region of the external semilunar cartilage.

A diagnosis of probable cyst of the external semilunar cartilage was made, and an exploratory operation advised should the symptoms persist.

Case x. A farmer, aged thirty, was examined in April, 1928. He complained of a tumor of the right knee which had slowly enlarged since it was first noticed five years before. He stated that there was a constant, dull aching pain in the knee which was aggravated by walking. There was no history of injury, and there had been no locking or snapping of the joint.

On examination, a mass, 1½ in. in diameter was found on the outer side of the knee at the joint line, just above and anterior to the head of the fibula. The tumor was fixed, tense, but semi-fluctuating and tender on pressure. Motion of the knee was normal, the mass moving with the tibia and being more prominent on full extension. The blood Wassermann test was negative. Roentgenograms of the right knee revealed a swelling with increased density in the soft tissues on the outer aspect of the knee joint. The adjacent portions of the articular surfaces of the lateral condyles of the tibia and femur were slightly flattened.

On April 24, 1928 the cartilage was removed. A curved incision was made on the lateral aspect of the knee. The cyst was carefully dissected away from the surrounding tissues and excised together with the external semilunar cartilage. The cyst arose from the middle third of the cartilage, was multilocular and contained clear, mucoid material. Following the operation the wound healed promptly and there has been complete relief of symptoms.

ETIOLOGY

In 31 of the 35 cases the cysts have involved the external semilunar cartilage, and in 4 the internal cartilage. The condition occurs most frequently in males, only 6 instances, including Cases III and IV of this series, being in females. The age of incidence varies from five to thirty-five years. Case II, in this series, a boy, five years of age, and Case IX, a boy eleven years of age, are the youngest patients in whom the diagnosis has been made. The etiology is not known. The theories which have been suggested may be classified as: 1. Degenerative, 2. Traumatic, 3. Congenital.

1. *Degenerative Theory.* The earlier German observers were of the opinion that the cysts were due to softening and colloidal degeneration of the periarticular tendinous or periosteal tissues about the knee owing to deficient nutrition following trauma. Phemister agrees with this view and points out that the pathological findings are identical with those of the cystic swelling or ganglions which occur in various connective tissues, especially on the back of the wrist. Ledderhose attributed the pseudocystic degeneration to a primary obliterative endarteritis of traumatic origin. This endarteritis is not constantly present, and it more likely, according to Phemister, that the vascular alterations are simply a part of the degenerative process and not the initial change. Jean concludes that the lesion is a pseudocyst caused by a peculiar type of degeneration of the fibrocartilage from unknown cause, perhaps favored by the avascularity of the tissue. Allison and O'Connor believe that the cyst represents the end result of a degenerative process caused by interference with the blood supply of the cartilage in the affected region, the exciting cause of which is a non-lacerating injury. Kleinberg states that the cyst is due to some form of injury or to disturbance of metabolism of the cartilage cells without injury, following which defects appear in the meniscus. As pointed out by Jean, there is no support for the theory of bacterial infection. Culture of the contents of the cysts and of fragments of the cartilage have been negative and there are no symptoms of inflammation. The blood Wassermann test has been negative in all cases.

2. *Traumatic Theory.* Practically all observers agree that trauma plays an important part in the causation although only about one-half of the reported cases give a history of definite injury. Fisher suggests that the trauma may be either from without or may be indirect through

strain of the tendon of the popliteus muscle, as this muscle lies in close approximation to the middle portion of the external semilunar cartilage at the one place at which the outer margin of the cartilage is covered by synovial membrane. Fisher also states that the cyst is a ganglion developed between the synovial membrane and the outer surface of the cartilage, although he admits the cyst may invade the cartilage. Zadek believes that the cysts are due to ingrowth of the synovia following tears of the outer portion of the cartilage. The chief argument against the traumatic origin is the fact that the cysts usually occur in the external cartilage while the internal cartilage is much more frequently traumatized. Also, it must be remembered that the tendency exists to attribute all joint disabilities to remote injuries.

3. *Congenital Theory.* Ollerenshaw has suggested that the cysts are developmental in origin due to fetal rests of the endothelial cells in the cartilage which, when stimulated by trauma, are rapidly distended. This embryonic hypothesis, which is analogous to the inclusion theory proposed by Cohnheim as the specific cause of neoplasms, is not generally acceptable.

PATHOLOGY

The gross appearance of the cysts in the 7 cartilages which we have excised has been identical and corresponds with the description of all previous cases. In 6 the external cartilage was affected and in 1 the internal. The cysts were located in the peripheral portion of the middle third of the meniscus, definitely within and a part of the cartilage, their outer walls being formed by a thin shell of expanded fibrocartilage. On the interior the cysts were divided by fibrous septa into several communicating cavities of varying size, the larger loculi generally lying toward the periphery of the tumor and the smaller ones centrally. The large spaces appeared to be formed by coalescences of the smaller cavities. The inner surfaces of the walls were smooth and glistening and the mucoid substance, thick and transparent, sometimes slightly tinged with red or yellow, resembled the colloid material in ganglions.

The microscopical appearance of the cysts has been a subject of debate. Ollerenshaw was the first to describe a definite endothelial membrane lining the cysts; other authorities state that no lining membrane is present. Kleinberg found the larger cysts lined by a layer of large flat cells resembling endothelial cells which he believed had probably arisen from lymph vessels. Zadek described the smaller cysts as lined by a membrane consisting of synovia-like endothelium. On the other hand, Phemister could find no evidence of an endothelial lining, nor could Prof. Latulle or Dr. Guy who examined the specimens reported by Jean, nor Walbach, who examined the cases reported by Allison and O'Connor.

Our impression from the examination of 7 cases is that the cysts arise from the splitting of the connective tissue fibers along parallel planes, and that no definite lining membrane is present. A careful microscopical study of Case x was made by Dr. J. A. McIntosh, whose report is as follows:

A section cut transversely through the specimen of cartilage consists largely of fibrocartilage with greatly thickened perichondrium. In the fibrocartilage there are many small linear spaces which seem to have been formed by cleavage along parallel surfaces. None of the cysts are spheric. The perichondrium is thickened and contains numerous thick-walled blood vessels and dilated lymph spaces. In the zone near the perichondrium there are irregular clumps of pale mononuclear and polynuclear cells.

A section through the wall of one of the large cysts shows many smaller smooth lined spaces traceable from the very small ones to the largest. In a few places the impression is gained from the regularity of position of the low elongated nuclei that there is a lining membrane, but there are other sites where the nuclei are not so regularly spaced and still many other sites where nuclei are absent. In the largest cyst there is a delicate areolar con-

nective tissue attached to a portion of the wall and it appears as if several smaller spaces had ruptured into the larger space leaving remnants of the ruptured wall floating in the fluid. The thickened blood vessels and infiltrating wandering cells indicate chronic inflammation. The relation of the cyst-like spaces and the dilated lymph channels is uncertain.

SYMPTOMS

The duration of the symptoms varies from a few weeks to several years. Case VI was observed one week following trauma, the symptoms having appeared immediately. Phemister states that the cysts seem to attain their maximum size within a few weeks, after which they remain stationary, and that there is no instance of spontaneous disappearance. This is probably inaccurate. In our fourth case the tumor subsided after a short duration although the other symptoms persisted, and in Case V the symptoms were recurrent. In Case VI the tumor disappeared and the pain was entirely relieved by aspiration of the colloid contents of the cyst.

The symptoms are similar to those of other derangements of the knee joint but without locking or snapping. Pain, limp and interference with joint motion, associated with a visible and palpable tumor in the region of the cartilage, are characteristic manifestations. The pain may or may not be constant, and is aggravated by functional use. The pain is also aggravated by rotation of the leg and is worse on full extension and flexion of the knee, the most comfortable position being at about 70° or 80° of flexion. The tumor is firm, resistant to pressure and tender. The size of the tumor varies but the location is fixed and unchangeable. It is always immediately overlying the cartilage on a level with the joint line and is firmly fixed to the tibia and moves with the tibia in all movements of the knee joint.

The roentgenogram is usually negative although a shadow in the soft tissues in the affected region may be visible, and rarely, as in Case X, there may be a slight flattening of the adjacent portions of the femoral and tibial condyles.

The treatment is surgical. Excision of the entire cartilage is recommended, as Riedel and Schmidt have reported the recurrence of the tumor when the cyst alone was removed. The functional result depends upon the damage to the joint structures by the mechanical pressure of the tumor.

CONCLUSIONS

1. Ten cases of cyst of the external semilunar cartilage are reported; in 7 the diagnosis has been confirmed by excision of the cartilage.

2. The etiology is still obscure, but the majority of observers agree that the cyst is caused by a degenerative process in the cartilage.

3. No definite lining membrane was demonstrated.

REFERENCES

1. Ebner, A. Ein Fall von Ganglion Am Kniegelenksmeniskus. *München med. Wchnschr.* 51: 1737, 1904.
2. Schmidt, E. Ein Fall von Ganglion Am Kniegelenksmeniskus. *München med. Wchnschr.* 53: 1415, 1906.
3. Eden, R. Naturwisschaftliche Medizinische. Jena, May 18, 1911.
4. Riedel, B. Seltenere Ganglion (Sehne und Sehnescheide meniscus lat. genu, Schmerzhafte). *Deutsche Ztschr. f. Chir.* 132: 167, 1914.
5. Ollerenshaw, R. The development of cysts in connection with the external semilunar cartilage of the knee joint. *Brit. J. Surg.* 8: 409, 1921.
6. Phemister, D. B. Cysts of the external semilunar cartilage of the knee. *J. A. M. A.* 80: 593, 1923.
7. Fisher, A. G. L. Internal derangements of the knee joint. Their pathology and treatment by modern methods. N. Y., Macmillan Co., pp. 14, 32, 1924.
8. Jean, G. Kystes du Cartilage semi-lunaire Externe du Genou (Meniscite Chronique pseudo-kystique). *Bull. et mem. Soc. nat. de chir.* 1: 775, 1924.
9. Allison, N., and O'Connor, D. S. Cysts of the semilunar cartilages. *Surg. Gynec. & Obst.* 42: 259, 1926.
10. Campbell, W. C. Surgery of the knee joint. *Southern M. J.* 17: 82, 1924.
11. Kleinberg, S. Cyst of the external semilunar cartilage with report of a case. *J. Bone & Joint Surg.* 9: 323, 1927.
12. Zadek, I., and Jaffe, H. L. Cysts of the semilunar cartilages of the knee. *Arch. Surg.* 15: 677, 1927.

PRIMARY LUNG CARCINOMA*

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IN the past six years we have had occasion to see and study 11 cases of primary lung cancer. From the bronchoscopic clinic at the University Hospital we have had opportunity to see and study the roentgenograms of a number of other cases. From this association it has seemed to us that either the disease is becoming much more frequent or else it is being more easily diagnosed.

Boyle[1] is credited with having "vaguely described pulmonary cancer" in 1810 and Stokes is credited with having distinguished several varieties of the disease, in 1842, his work being published in the *Dublin Journal of Medical Sciences*. Although Ebermann,[2] in 1857, was able to collect 72 cases of supposed lung cancer, it remained for Jaccoud[3] ten years later clearly to distinguish this disease from tuberculosis. Microscopical studies of primary lung cancer were first made by Langhans,[4] Marchiafava[5] and Malassez[6] during the years 1871 to 1876. Since that time the literature has grown to very considerable proportions so that Adler,[7] in 1911, was able to tabulate 374 cases and a few years later, in 1916, Scott and Forman[8] reported 120 additional cases. The increased frequency can be readily understood when one finds that Brunn[9] in a very admirable paper on this subject, which was read before the American Association for Thoracic Surgery, in May 1925, was able to collect 626 cases from the literature.

INCIDENCE AND ETIOLOGY

In collecting 382,671 necropsies, from 1872 to 1898, Brunn found 159 cases of primary lung cancer, an incidence of 0.04 per cent. From 1898 to 1916, in 192,271 necropsies he found evidence of 488 cases or 0.24 per cent, an incidence six times greater than that reported in the first group. From 1916 to 1924, in 33,308 necropsies there were 71 cases, an incidence of 0.21 per cent. Ewing[10] believes that primary cancers of the lung are found in 1 per cent of all cancers, while Kauffman[11] places the incidence at 1.83 per cent.

In the reported cases the disease occurs nearly three times as frequently in the male as in the female, while in our own cases, 6 have been males and 5 females. Although, as in many diseases, cases have been observed at the extremes of age, 90 per cent of the reported cases have occurred between the ages of forty and eighty and 62.5 per cent between the ages of forty and sixty years.

From the reported cases, many of the records of which are incomplete, the right lung seems to be affected more often than the left. Perrutz[12] in 106 cases found the lesion in the right side in 54 per cent, on the left in 35 per cent and bilateral in 10 per cent.

The etiology of this disease is obscure as is the etiology of all cancer, but it presents many interesting problems which will warrant considerable study. Long-continued irritation, chronic inflammation and infection have been considered by many as the major etiological factors. In this connection the work of Alfred Arnstein,[13] of Vienna, is interesting. In a dissertation before the German Pathological Society in 1913 he discussed the occurrence of pulmonary cancer among the miners of the Schneeberg district of Saxony. The minerals mined are mostly cobalt, bismuth and nickel. Cancer of the lungs was given as the cause of death in 44 per cent of the deaths of the miners admitted to the hospital in this district. Since few necropsies were performed, it is

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likely that many of these deaths were due to tuberculosis or pneumoconiosis, but in the necropsied cases the incidence of cancer was high.

Although Rokitansky,[14] in 1854, stated that tuberculosis and carcinoma were antagonistic, especially in the same organ, we now know not only that this observation was false, but that tuberculosis is considered a major etiological factor. In fact, Ewing very positively says it is "the chief etiological factor . . . In the old scleroses, atelectasis and reparative lesions of tuberculosis may be found many alterations of bronchial and pulmonary epithelium, marked by considerable cellular overgrowth."

In our own experience the disease has been much more prevalent since the influenza epidemic of 1919. The chronic bronchitis, which persisted in so many cases and which is so often associated with an overgrowth and metaplasia of the bronchial mucous membrane, may offer a nidus for the origin of the lesion in that in this, cellular alteration may lead to a lack of tissue restraint. The greater frequency of cigarette smoking with the tendency to inhale the smoke, and the increased bronchitis coincident with increased dust and smoke, may also be factors. One of our cases was a miner and we await with considerable interest further studies such as those made by the Bureau of Mines in regard to pneumoconiosis to determine the relationship between anthracosis and malignant disease.

TYPES

There are three groups of lung cancers. The disease may arise from the (1) bronchial epithelium, (2) bronchial mucous glands, or (3) alveolar epithelium. Any specific gross anatomical and clinical features that these groups may have belong nearly entirely to the very early stages of the disease and as such are rarely recognized.

The squamous-celled carcinoma, which is the type most frequently seen, originates from the epithelium lining the bronchi. It is usually of slow growth and when favorably situated it may, especially if seen early, be suitable for surgical treatment. These tumors frequently cause occlusion of a bronchus during their growth. The superficial tumor may become necrotic and bronchiectatic cavities result. The ulcerating and dilated bronchi may form cavities in the center of the tumors and as such may be mistaken for bronchiectasis or lung abscess. The tumors arising from the bronchial lining epithelium may also be of the cylindrical-celled alveolar carcinomatous type. The group as a whole is characterized by papillary projections from atypical proliferation of the lining epithelium. In these hemoptysis is fairly common.

The carcinomas arising from the bronchial mucous glandular epithelium are in the majority of instances limited chiefly to the walls and especially the submucosa of the bronchi. The lining of the bronchi is rarely invaded and bronchial stenosis rather than bronchial dilatation occurs. The structure is that of an adenocarcinoma or alveolar carcinoma having characteristics of the bronchial mucous glands. These tumors are characterized by excessive mucous secretion.

A diffuse or multiple and nodular tumor may arise from the lining of the pulmonary alveoli. A single lobe or the entire lung may be involved. Cavitation from necrosis is frequent. The pleura is generally involved and metastasis is frequent. In the nodular type the lung is peppered with many poorly defined tumors of varying size. The structure of this group varies considerably.

METASTASIS

The metastasis from these tumors is usually widespread, but as in all cancers it will vary with the degree of malignancy. The bronchial nodes are usually affected early. In 374 cases Adler reports invasion of the bronchial nodes in 117, mediastinal

45, tracheal 26, cervical 23, retroperitoneal 23, and with decreasing frequency in many other regions. The liver was invaded in 103 cases and the brain in 53; in fact few organs have been free from secondary invasion. The ribs, spine, skull and sternum are the bones most frequently involved in the order named. The heart is more often involved than in any other malignant growth.

SYMPTOMS

The symptoms of this disease are due to alterations of normal physiological processes. For this reason and because in the slowly growing tumors the remainder of the lung tissue attempts to compensate for tissue loss, the symptoms are variable and in many cases the patient is nearly symptomless until the tumor has reached inoperable proportions. The physical findings are often indefinite but with the symptoms they are at times extremely suggestive. Patients suffering from pulmonary malignancy are often admitted to sanatoria with the diagnosis of tuberculosis. The clinical laboratory is of little aid in the diagnosis, for negative sputum examinations exclude neither tuberculosis nor cancer. If the patient has indistinct signs of pulmonary tuberculosis and a definite pulmonary lesion, cancer should be suspected. It is the latency of pulmonary malignant growths that makes them so deadly.

In our own cases cough was the first symptom in the majority of cases. It was complained of as one of the major symptoms in 9 of our 11 cases. This is caused either by tracheal irritation of a hilus tumor, or bronchostenosis with the damming of secretions behind an obstruction, or bronchial dilatation with resulting bronchiectasis. In the cases of stenosis the cough is of a paroxysmal, barking type and there is little expectoration early. Later the increased secretion of the glandular endobronchial type of growth may give rise to profuse expectoration. In the cases which have associated bronchiectasis the expectoration is usually profuse and at times purulent, especially when secondary infection has supervened.

The sputum is often blood-tinged or frankly bloody. This may appear early in the papillary growths arising from the bronchial epithelial lining or it may appear later when the growth has invaded the blood vessels surrounding the bronchi and alveoli. In those cases having associated abscesses with secondary infection the sputum is not unlike that of an abscess communicating with a bronchus. In none of our cases were we ever able to identify tumor cells in the sputum. Although this is given as a means of diagnosis, I believe that little reliance can be placed on a negative report. The characteristic currant-jelly or prune-juice type of sputum has also been lacking and, although it may occur occasionally, is not seen very often. It should also be remembered that tuberculosis was present in 10 per cent of all the cases reviewed by Brunn, so that a positive sputum does not exclude the possibility of a coexisting cancer. This should be kept in mind, especially with individuals past forty years of age.

In many cases dyspnea is an early symptom. In fact in many of the reported cases which were carefully analyzed it was the first symptom. As the dyspnea increases, cyanosis may become manifest. This is especially true if the tumor is close to the hilus so as to cause obstruction of one of the main bronchi or if, by pushing into the mediastinum, it produces tracheal stenosis. In the peripheral tumors dyspnea is a late symptom, but in the rapidly growing alveolar tumors it may appear relatively early. Since pleural effusion occurs in many of the peripheral tumors, especially those involving the pleura, this too may in some cases be the cause of the dyspnea.

Pain which is continual and agonizing is often an early symptom. In our own series it was one of the major symptoms in 7 cases. The interesting fact in relation to this symptom is that pain is often present when there is no evidence of pleural

involvement; that is, there appears to be a true visceral pain, although from what we know of visceral pain in general, this is difficult to believe. The pain may have a wide radiation and may not be confined to the limited area of pleural or pulmonary involvement. It is relieved only by morphine and then only for a short time. Paravertebral injection gives some relief, but because of the wide radiation of the pain this procedure is not as efficacious as might be expected.

Fever occurred in 9 of our cases. In some it was associated with chills and sweating. In every case in which fever was a constant symptom there were evidences of an associated secondary infection. Two of our cases were operated on for lung abscess, although in 1 of these the diagnosis of a preexisting malignant growth was made before operation. Abscess cavities, bronchiectasis and bronchial suppuration are frequent concomitant lesions of lung cancer and in such cases the marked febrile reaction is the result of the secondary infection. It should be stated, however, that even in the early cases we have noted a febrile reaction of 99°F. to 100°F. without any evidence of a superimposed infection.

Cachexia, in my opinion, is usually a late manifestation. It is not a prominent symptom until suppuration or extensive metastasis has occurred or until continual loss of sleep from recurring pain makes life unbearable. In the central growths cachexia may be a relatively early symptom, but these are the "silent tumors" and the loss of weight bespeaks an advanced age of the growth or a very rapid progression of the disease.

Only 1 of our cases showed an advanced osteo-arthropathy. Although a second showed this to a slight degree, it was not as marked as that associated with long-standing pulmonary suppuration. It is my opinion that the majority of cases exhibiting this very interesting symptom have coexistent pulmonary infection and suppuration with the formation of abscess cavities or other ulcerations.

DIAGNOSIS

The latency of many of these growths makes diagnosis difficult in the early cases. We may say, however, that in doubtful cases it is well to consider malignancy, especially when pain, dyspnea and blood-tinged sputum are present. The first two symptoms are rarely seen in early pulmonary tuberculosis. The physical signs are often confusing. They may be entirely absent unless there is bronchial obstruction or the tumor is expanding toward the lung periphery. Even when present the signs may be masked by coexisting tuberculosis, bronchitis, emphysema, etc.

There are, however, several very important and direct aids to diagnosis. Of major importance is the roentgen ray. The roentgen-ray shadows of primary lung tumor present pictures that are quite unlike those of the more common inflammatory processes with which they are so often confused clinically. Stereoscopic and lateral views are of the greatest value and should always be made when primary carcinoma is suspected.

In 2 cases we have made the diagnosis from cervical glands which had become involved by metastasis. Unfortunately, such a procedure is applicable only to very advanced growths beyond hope of any help. In 2 other cases we inserted a large aspirating needle through an intercostal space directly into the tumor. In this way tissue may be removed for microscopic examination. In the cases with associated suppuration this must be done with considerable precaution. If other methods fail in establishing the diagnosis, exploratory thoracotomy and biopsy are permissible. The operation may be done under local anesthesia and entails no great risk. In the bronchial growths much help may be expected from the bronchoscopist. He can assist in clearing up suppurative foci that communicate with a bronchus and at the same time he can remove tissue for examination. In the endobronchial growths with bronchial stenosis early diagnosis by bronchoscopic means may be impossible.

TREATMENT

This may be divided into that tending to produce amelioration of symptoms and that attempting to cure. For the first irradiation is the only means at present at our disposal. In some cases the improvement, although only temporary, is marked. However, just as in the treatment of carcinoma of the esophagus, the roentgenologist cannot point to a single cured patient in a proven case.

The surgical treatment although hazardous is the only means of actually obtaining a "cure," if such is to be obtained. Unfortunately, most of the tumors are seen when metastasis makes operation worthless or when pleural adhesions increase the risk from lobectomy. Lobectomy is applicable in the treatment of central tumors. The mortality should not be as great as that after lobectomy for pulmonary suppuration. The peripheral tumors can be fulgurated or excised once the parietal and visceral pleura have become adherent. The danger here lies in opening the free pleural cavity. In the hilus tumors or those primary pulmonary growths which have involved the mediastinum surgical removal is as yet fraught with too great dangers.

There are, however, a number of these cases which if diagnosed early could be subjected to surgical treatment with a reasonable hope of cure.

SERIES OF 11 CASES

1. Males, 6.
2. Females, 5.
3. Age:
   Lowest, 35; oldest, 72; average, 54 years; 64 per cent between 40 and 60 years; 18 per cent, 70 or above; 18 per cent, below 40.
4. Duration:
   Shortest, 1 month; longest, 6½ years; average, 11 months, omitting case giving history for 6½ years. Average duration is 4.2 months.
5. Lung affected:
   Right side, 5; left side, 6. Lobe; right, upper, 3; lower, 1; whole lung, 1. Left, upper, 1; lower, 3; whole lung, 2.
6. Symptoms:
   Major symptoms complained of: 1, Pain, 7; 2, cough, 9; 3, hemoptysis, 5; 4, dyspnea, 6.
7. Evidences of secondary infections:
   Abscess, bronchiectasis or suppuration, 3; fever, 6; slight fever 3.

REFERENCES

1. Boyle. Récherches sur la Phtisie Pulmonaire. Paris, 1810.
2. Ebermann. De Cancer Pulmonum. Petropoli, 1857.
3. Jaccoud. *Clin. Med. d. Charite.* Paris, 1867.
4. Langhans. *Virchow's Archiv.*, 53: 470,
5. Marchiafava. *Riv. clin. de Bologna*, 150: 1873.
6. Malassez. *Arch. de Physiol.*, 1876, 353.
7. Adler, I. Primary Malignant Growths of the Lungs and Bronchi. N. Y., Longmans, Green, 1912.
8. Scott and Forman. Primary carcinoma of the lung. *Med. Record*, 90: 452, 1916.
9. Brunn, H. Primary carcinoma of the lung. *Arch. Surg.*, 12: 406, 1916.
10. Ewing, J. Neoplastic Diseases. Philadelphia, W. B. Saunders Co., 1919.
11. Kauffman. *Virchow's Archiv.*, 189: 414,
12. Perrutz. Inaugural Dissertation. München, 1897.
13. Arnstein, A. *Deut. Path. Gesellsch.*, 16: 332, 1913.
14. Rokitansky, A. A Manual of Pathological Anatomy, 1: 313, 1854.

RADIUM IN THE TREATMENT OF CANCER*

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REQUEST has been made that I discuss at this time the practical, present-day position of radium in the treatment of cancer. In order to do so I shall attempt to make an appraisal of and draw some conclusions from our experiences with this agent at the Memorial Hospital during the past twelve years.

I shall ask you to carry certain fundamental facts in mind throughout the discussion. The term "cancer" embraces a large group of closely allied diseases, of unknown cause, for which we have no specific treatment. Radium is a relatively new therapeutic agent about which practically nothing was known, clinically, fifteen years ago. The treatment of cancer today depends upon surgery, including cautery methods, radium, roentgen rays, and possibly some constitutional agents of the non-specific foreign protein therapy group. I say "possibly" because I am not advocating this form of therapy.

The present discussion is limited to but one angle of the general problem, namely, what has radium accomplished and what are its possibilities?

Apart from all therapeutic considerations I would place foremost the contribution made by radium to the general study of cancer. Until about fifteen years ago, cancer was looked upon, in general, as a single disease. Study of cancer treatment was almost entirely in the direction of problems incident to surgical anatomy and surgical technique. The latter has been perfected to the point where, broadly speaking, little more can be accomplished. The work of some of the best known radical operators of a quarter century ago compares very favorably with that of some of the more radical surgeons of the present.

Only recently has cancer been recognized as a large group of closely allied diseases with widely differing individual characteristics.

The physical agents, radium and roentgen rays have forced a very careful histological and biological study of malignant tissues. Such study is essential to efficient radiation. The prolonged, intimate and detailed observations, both gross and histological, incident to treatment by radiation, have given us a much clearer conception of the many groups of malignant disease coming under the general heading of cancer. Histological study of tissues under radiation is constantly adding to our knowledge of radiosensitivity or resistance. Indeed, several new groups of neoplasms have come to be recognized as definite clinical entities through their peculiar response to radiation. As outstanding examples, mention may be made of the transitional cell carcinomas described by Ewing and of the endothelial myeloma of bone, also first described by the same observer. Both of these tumors were recognized through their peculiarly ready response to radiation and upon further investigation proved to be very characteristic, both histologically and clinically. The clinical index, indicating the relative degree of malignant aggressiveness, as outlined by Broders, is applicable in large measure as a guide to the relative radiosensitivity of the tumor. From that large group of tumors formerly classed as fibrosarcomas we have found that the majority have their origin in nerve sheaths. These neurogenic tumors vary widely in their histological structure, and classification on the basis of Broder's cellular differentiation fits very well the variation in radiosensitivity. In other words, proper

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relative histological classification within the group is a valuable guide to the response which may be expected from radiation. Conversely, the response to radiation in many types of tumor is of assistance from a diagnostic standpoint.

From a practical clinical standpoint, radium has relieved surgery of responsibility in the care of inoperable cancer. If radium has never cured or contributed to the cure of a case of cancer, it has amply justified itself as a palliative agent. There is no longer any excuse for attempting operative surgery in any but the most favorable case, on the ground that some effort must be made to relieve the patient. The growth restraint, with temporary complete or partial control of symptoms which may be accomplished through radium is far more effective than any of the former efforts at palliative surgery. As examples one might point to advanced carcinoma of the cervix uteri, or advanced carcinoma of the mouth, with or without cervical metastases. The rate and mode of growth may be altered, bleeding arrested or prevented, discharges eliminated and hence avoided. Pain may be considerably relieved or prevented.

This does not mean, however, that radium is an agent of last resort. I mention the palliative benefits here, not only because of their real merit, but to call attention to the fact that there is a decided difference between the employment of radium palliatively and curatively. In the latter instance, a much greater intensity of radiation is not only permissible but is essential.

The field of operable cancer has been limited in two ways by radiation. The limits of strict operability have been narrowed rather sharply in many groups, one of which is carcinoma of the breast. In many cases the grossly palpable evidence of disease may be anatomically and technically operable and yet the case be inoperable for certain reasons. The patient may be very elderly, unequal to the surgical shock or a very young one in whom the disease is practically never eradicated by an extensive dissection. It may be a case in which the farthermost palpable nodes are questionable. There is no excuse for operating upon such cases with our present resources in the form of radiation.

Experience with radiation has gradually shown that certain groups of operable cancer are managed better by radiation than by surgical extirpation. As examples one might cite early intra-oral cancer and cancer of the cervix uteri. The latter group, probably more completely than any other group of malignant diseases, has gone completely into the field of radiation. Attention should also be drawn to the distinction between carcinoma of the cervix uteri and carcinoma of the fundus uteri. While involving different portions of the same organ they are histologically, anatomically and clinically different and on this basis the former group lends itself best to treatment by radiation, while the latter is best cared for by operative surgery.

Not only has radiation limited the field of surgical operability but it has altered considerably the character of cancer surgery. Many of the technical procedures have been altered and new ones introduced. Standard types of operative procedure have in some instances been curtailed because of employment of radiation to care for some phase of the disease in conjunction with surgical extirpation. It is frequently necessary to expose a tumor surgically in order to introduce and distribute radiation accurately. This procedure is resorted to in dealing with deep fixed masses in almost any part of the body, whether it be a fixed metastatic cervical node secondary to mouth cancer or an inoperable neurogenic sarcoma in the depths of the thigh. Buried radium emanation must be accurately placed to be effective: hence a median laryngotomy is indicated and amply justified in dealing with many intrinsic carcinomas of the larynx.

In this connection one might mention the limitation, by combining surgery and radium implantation, of many of the former extensive surgical procedures which might well be classed as horrible. I refer to

such procedures as total laryngectomy and many of the technical procedures carried out in an effort to get beyond intraoral growths.

This change in the character of cancer surgery brought about through combining radiation with surgery has, I believe, demonstrated that cancer surgery today represents a special surgical field, somewhat complicated because of physical considerations, and of a highly technical character.

The best treatment of cancer today requires both surgery and radiation; the two are interdependent. I specify "radiation" rather than radium alone, because both radium and roentgen rays are essential. There is little or no overlapping between these two physical agents. As far as large external doses are concerned, radium is superior to roentgen radiation if comparable quantities are used, but the economic factor is such that relatively few patients are fortunate enough to have the advantages of radium in adequate amounts for external distance doses. A good dose of roentgen radiation is obviously better than a poor dose of radium. Consequently, from an all-round practical standpoint the bulk of external distance radiation must be done with roentgen rays. On the other hand, radium lends itself best to localized surface applications, to introduction within body cavities, and to direct implantation in tissues.

As far as its application in cancer is concerned, radium is a surgical agent, and should be in the hands of the surgeon as a piece of additional surgical equipment. The surgeon who assumes to handle this new equipment must familiarize himself with its properties and action, physical, histological and biological, if he is to use it fairly and to best advantage. Radium must be applied accurately, whether on or in the tissues, and the method of application must be based on sound physical principles.

It is beyond the scope of this discussion to go into a detailed consideration of the mode of action of radium and the various tissue reactions. I must, however, call attention to the fact that the effect on tumor tissue, both inhibitory and destructive, is not brought about solely through the direct action on the tumor cells. The effect on the surrounding tissues—the tumor bed—is quite as important, in my judgment, as the direct effect on the tumor itself. The more embryonal the tumor, in its histological characteristics, the more radiosensitive it is; yet, there is a wide variation in its response, dependent upon the condition of the tumor bed. If the blood supply to this area has been altered by previous surgery, with its resultant fibrosis, the reaction will not be as favorable. In the presence of a marked secondary anemia or infection, the same lack of a normal radiation reaction is noted.

The technical and physical considerations incident to radium application are also too complicated to permit of discussion at this time, except to mention one point. This work is highly specialized and with added experience is steadily becoming more so. It cannot be carried out single-handed, to best advantage, in any sense of the term. An adequate radium supply is essential to provide the many variations in applicators containing radium energy for different types of cases. An adequate technical equipment is necessary to provide for this and a physical knowledge of the subject, of steadily increasing complicity, is essential to its application.

In some few instances radium alone is sufficient to control completely and eradicate malignant disease. This is true in the majority of skin cancers, in carcinoma of the cervix uteri, and in intra-oral cancer. For the most part, however, the combination of surgery, radium, and roentgen radiation is necessary to produce best results. It is unfortunate that in many quarters the idea seems to prevail that some sort of antagonism exists between surgery and the physical agents. Such is not the case. All are of value in combating cancer and in the most judicious combination of these agents lies our greatest strength.

The opportunities for combining these

forces are many. In conjunction with radial surgery in operable cases pre-operative and postoperative radiation has proved of value: the former is, in my opinion, far the more reasonable and efficient. Under certain circumstances very thorough preliminary radiation prepares for a subsequent surgical procedure of lesser extent, yet affording a better permanent result. Some of the bulky growths of the lower rectum can be handled in this manner whereas the most radical surgical extirpation alone is useless.

As an immediate pre-operative or co-operative method of radiation, the direct implantation of filtered radium emanation at suspicious points in the surgical field affords the most accurate and efficient means of radiation at our disposal. We employ this combination always in our neck surgery for metastatic nodes secondary to intra-oral cancer. It is sometimes possible to treat a growth thoroughly by external and implanted radiation and yet leave a complication in the form of inadequate drainage. Here surgery may be resorted to simply to afford drainage with no responsibility for the direct removal of tumor tissue. This condition presents itself frequently in connection with growths in the maxillary antrum and accessory nasal sinuses. In this same location it is at times impossible to apply radium accurately throughout the tumor-bearing area because of upward and backward extension of growth. If such is the case surgery is resorted to, not only to facilitate drainage but to gain access for radium application as well. Surgical exposure with subsequent direct implantation of filtered radium emanation is a combination capable of wide application. We resort to it regularly in dealing with metastatic cervical nodes in which the disease has perforated the capsule of the node with secondary invasion of adjacent structures. The same may be done with fixed axillary nodes. Deep inoperable tumors anywhere may be more thoroughly and more accurately radiated by these means. The possibilities, particularly in connection with intra-abdominal tumors, are many. I have already mentioned this method in dealing with intrinsic carcinoma of the larynx, particularly those growths extending subglottic.

It is impossible to discuss here in detail the application of these combined methods in the many major groups of malignant diseases coming under the general head of cancer. Very few cases of cancer today are treated to best advantage without the participation of the physical agents at some stage. In many it is a problem of radiation alone. External radiation at a distance from the skin surface to permit of deep penetration and absorption is capable of the widest application. To date it has demonstrated its value and the future possibilities, in the light of increasing physical and histological data, are almost unlimited. This external radiation is provided by the use of heavily filtered roentgen rays or very large units of radium. For the more intimate applications of radiation, either surface, in body cavities, or by direct implantation within tissues, radium is the one source of therapeutic energy. The form in which it may be made applicable to the individual case is dictated by the type and extent, as well as the histological characteristics and anatomical relations of the growth, together with many physical factors.

The question is quite naturally asked: What are the results of combining radiation in so many forms either alone or with surgery in the treatment of cancer? On account of the wide variation in growth characteristics and the relative radiosensitivity of the many groups of malignant disease to be considered it would be obviously impossible to attempt an appraisal for each.

I believe, however, that our percentage of permanent results in unselected cases is approximately equal to those of surgery alone in the operable group. In addition, the amount of palliative relief is something which can neither be calculated on a percentage basis nor overestimated.

GENERAL PERITONITIS*

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THERE are cases that come to the surgical clinic quite late or of relatively few hours' duration with a fulminating type of infection. Fortunately these cases are now much less frequent than a decade or two ago. However, patients in profound shock and extreme degree of systemic infection are still admitted. The rapid, thin, thready pulse and markedly distended abdomen, accompanied by persistent vomiting are conditions of very serious omen.

Many times in these cases the acute pain stage has passed and the temperature does not run extremely high, in fact may be subnormal. A signal for immediate surgical intervention, however, is the fact that the trouble began with severe abdominal pain accompanied by a temperature of 101°F. to 103°F. and later the pain subsided and the temperature dropped to base line or below. The dropping of the temperature seems to show rather poor resistance. The disappearance of acute, spasmodic pain, accompanied by abdominal distention, means that there has been a leak into the peritoneal cavity and a rapid formation of thin, floculent pus which has so toxicated the peritoneum that the nerve endings have become more or less paralyzed and the intestinal tract splinted by this dulling of peristaltic and segmentary movements.

The laboratory findings in these cases may be significant. The urine is likely to reveal a trace of albumen, and a rise of five or ten points in the specific gravity. The blood picture reveals a white count elevated in ratio to the individual resistance. The differential count shows the polynuclear leukocytes in the majority increased in direct ratio to the individual resistance of the patient. Upon admission the individual in extremis is dull mentally and very limited in physical activity, with an acute poisoning from an overdose of chemical toxines the result of infective fermentation. Such cases require immediate action and free drainage.

ETIOLOGY

This general infection of the peritoneal cavity may come from several sources: A ruptured gall bladder, a perforated gastric or duodenal ulcer, a ruptured appendix or pyosalpinx. These four sites of beginning are individually serious and demand early action. Of course innumerable other things might be considered, such as a perforation complicating typhoid fever, intussusception or volvulus with secondary gangrene and the soiling of the peritoneum, perforation empyema, trauma of external origin, ruptured pyonephrosis, etc. However these latter cases usually have a definite history leading up to the present condition and also are very likely to have a persistent vomiting. Our experience has been that pain and temperature do not have as much of a bearing upon the diagnosis as was formerly believed. In the majority of instances the appendix, pus tubes, gall bladder and gastric or duodenal ulcers, in the order given, are the offending members.

TREATMENT

This is most important, regardless of the case, as there is a general peritonitis and a very sick patient. The earlier drainage is instituted the better are the chances for recovery. In our own clinic it has been found that we give the patient the best chance by using free drainage with as little trauma and in as short a time as possible without attempting to explore the abdominal cavity too much. In the majority of instances the patient has been found far too ill for the primary cause to be removed.

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Let out the toxic fluid, support the patient with adjuncts and give him a chance to immunize and rest, and he may get by the hazardous turn. It is very important to establish sufficient drainage from the bottom of every quadrant of the abdomen, and especially the lower half.

In these cases the patient generally leaves the table in a somewhat shocked condition. The dexterity with which the operation is done, combined with expediency and accuracy, together with the method of administration of the proper anesthetic, all very materially assist in reducing the degree of shock. In our clinic it has been found that a normal saline solution given by axillary sup during the operation will aid very much in these cases.

Axillary Sup. Saline is given by this method during the operation. A two-quart reservoir is suspended on a staff at the head of the operating table. By the use of a lengthy Y rubber tube with a No. 9 gauge needle at the end of each arm, the saline is permitted to flow continuously into the axillary spaces thus permitting the patient to drink from one pint to two quarts during the operating period. The method of introducing the sup needles is important. These needles should be directed perpendicularly to the body surface piercing the skin covering the outer third of the pectoral muscles and continuing on piercing the pectoralis major muscle and in this way entering the axillary space and being entirely free in this area. By so directing the needle the pectoralis major muscle holds the needle perpendicular permitting of a free flow of the saline and as the axillary spaces are freely distendable they will each easily hold one quart of the fluid. Thus the patient is permitted to drink freely of saline kept at an even temperature by coils of the rubber tubing resting in a basin of sterile water kept at an even temperature.

Our experience has shown that many patients coming to the operating room in a poor condition and with extreme toxemia, emerge in a better condition than when they entered, through the use of the axillary sup. The pulse will be improved, the color better, the general circulation augmented and the respirations deeper, more even and regular.

Axillary sup is a general supporter. By its influence the toxemia of general anesthesia is diluted postoperative vomiting almost entirely eliminated. This is a great help to these cases in extremis. They have enough bodily exertion before them without the additional strain of vomiting and its resultant weakness.

Early Skin Activity. Here again a beneficial effect of the axillary sup is observed. Early and vigorous skin function has a tendency to make the patient feel better. By this free perspiration the cellular waste toxines are eliminated in large quantities and the individual cells allowed to function properly without any harnessing or clogging. When the patient is returned to bed the axillary spaces are well filled with a supporting fluid. They not only drink freely during the operation but they continue to imbibe freely during the two or three hours after returning to bed. This drinking is accomplished directly into the lymphatic and general circulation without any local irritation to the gastric mucosa. The patient remains water-logged without being compelled to upset the stomach.

Again, the post-anesthetic thirst of which patients so often complain is entirely eliminated by the use of the axillary sup. That parched sensation in the mouth and esophagus does not appear. The dryness of the respiratory tract is not noticed. The elimination of these disagreeable sensations following the administration of any general anesthetic is certainly a boon to the patient.

Another favorable effect of the axillary sup on these extremely toxic surgical cases is early kidney activity. The kidneys begin hyperactivity on the operating table, and within a very few hours after being put back to bed they secrete large amounts of urine and void freely. Thus the toxic protein waste material and excess of uric

acid are secreted and excreted. This is of great assistance to the already overtaxed bodily economy of the patient. By the time the axillary spaces are empty the patient is ready to drink water freely and the supersaturation can most profitably continue.

Glucose Axillary Sup. Another advantage of the use of the axillary sup in these cases is that it promotes the freeing of glycogen at regular intervals, instituting self-feeding within the patient's own bodily economy. Up to this time the liver has been the storehouse of glycogen to be used when any physiological emergency arose such as extreme physical exertion. This being one of the chief functions of the liver, nature is ready to release it in health, and in disease the only thing necessary is a medium to take the place of extreme physical exertion. Glucose solution administered at regular intervals seems to accomplish this end.

Technique of Administration. In our clinic 40 c.c. of a 5 per cent solution of glucose is given every three hours. A 50 c.c. syringe with a 3 in. No. 9 gauge, Luer needle is used. The skin surface over the pectoralis major muscle is carefully cleansed and surgically prepared. Every precaution is taken as in a surgical operation and the field is carefully surrounded with sterile towels. The needle is then introduced perpendicular to the skin surface at a point approximately 1 in. inside of the outer margin of the pectoralis major muscle. The needle pierces the skin and is forced down through the pectoralis major muscle and into the axillary space. The fingers of the left hand guide the needle point as it reaches the axillary space. By using this technique there is no pain produced. When the syringe is emptied and the needle withdrawn the aperture is sealed with collodion. This amount of solution is entirely absorbed in about thirty minutes. The collapsed, toxic patient gets much benefit from this treatment.

Posture. With these cases in extremis the first four or five days count very much when proper posture is instituted. What we term the modified Fowler position is used. The head of the bed is elevated by a wooden frame standard elevator which our carpenter made. The elevation from 6 inches to 2 or 3 feet as desired can be made. By using this standard the mattress plane is not broken and the patient lies flat so far as this surface is concerned. With the head of the bed thus elevated and the patient turned on the pendulous area side with pillows at the back and one pillow between the knees he is made very comfortable, the drainage is free and complete and he can sleep well. Thus added reserve is gathered and yet free and complete drainage goes on at all times.

Murphy Drip. For years our clinic has used this method of giving sterile water per rectum. The water is run through a heating coil kept at a temperature of 105°F. One drop per second is given permitting one dr. per minute to enter the lower bowel. If at any time this fluid is not retained, it is given for one hour only every third hour. In this way the patient can drink freely per rectum and thus supersaturate the body cells preventing too rapid cellular waste and resultant toxic protein accumulation.

Boric Acid Fomentations. In these severe general peritonitis cases we have learned that moist heat gives great service to the abdominal wall in resisting the extension of the infection. These moist applications also promote free drainage by augmenting capillary attraction. For these fomentations a saturated solution of boric acid in sterile water, temperature 160°F., is used.

Technique of Application. Strict aseptic precautions are followed out. The nurse scrubs just as thoroughly and carefully as for a laparotomy. An unsterile nurse acts as assistant to handle all unsterile materials and to prepare the bed clothing. The patient is prepared as for a surgical dressing. All dressings are removed and the wound surface cleared. The area is then carefully walled off with sterile towels.

Forceps are used to wring out the sterile flannel pads in hot boric acid solution. We have found that sterile flannel pads one foot square serve best to hold the heat. This is a very important part of the procedure. (As these flannel pads are received they are carefully washed in soap and water, then boiled for one hour and after being thoroughly dried in the sunshine and fresh air are again sterilized in the autoclave.) Three layers of these hot, moist, sterile flannel pads are applied over the wound and then a thick, dry, sterile, gauze abdominal pad is placed over these; this is covered with an oiled silk covering and the binder applied. The entire dressing is then superimposed with hot water bottles to keep the dressing thoroughly warmed, between changes. These dressings are continued from four to seven days depending upon the amount of drainage and tympany present. These hot boric fomentations are of great aid in maintaining capillary attraction, elevating the local resistance of the abdominal wall and maintaining local bodily heat. The wound is kept clean and no great accumulation of drainage is permitted so that the wound edges and skin surface are kept from re-infection.

Artificial Heat. To maintain a constant incubation of the patient he is wrapped in a heated blanket as the first layer of covering. That he be entirely enclosed in this blanket except for the head is a very important part of the technique. He is fully wrapped from the neck down, back as well as front, in the blanket and the bottom of it turned up under his feet. A sheet is then placed over this blanket and a dozen hot water bottles placed about the patient, five on each side from the shoulders to the feet and two bottles at the feet. Two blankets are then placed over the sheet and tucked in well on both sides. By carrying out this technique of wrapping the patient and changing the hot water bottles frequently, a constant, even heat can be maintained for the first twelve to twenty-four hours. By this procedure any bodily radiation is prevented and the thermic center is given a rest.

Medication. Drugs are seldom used in these cases. Of course if the cardiac muscle calls for extra temporary support, this is given in some form hypodermically. The same statement holds true relative to the control of pain. However, in recent years, no drugs are used in the average case unless urgently signaled for as in the case of the heart muscles or pain nerve transmission. The majority of cases do better without drugs. Now and then in the extreme cases a shock enema is given once or twice during the first twenty-four hours, but even this is used very seldom.

The above technique as carried out in our clinic over a period of years has given such satisfactory results and has so materially lowered the mortality rate in these in extremis cases that it has seemed worth while to review it.

THE RELATION OF THE RETICULO-ENDOTHELIAL SYSTEM TO GENITOURINARY WORK*

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EVER since Metchnikoff established the fundamental principle that all somatic functions depend on cellular activity and not, as was formerly believed, upon the influence of the somatic juices, special attention has been paid to this cellular function.

Later on Aschoff and Landau comprised the cells in which reside the defensive forces of the body under the name reticulo-endothelial system.

In order to justify the term system it was necessary to demonstrate that these cells show a uniformity as to origin, morphology and function.

As a matter of fact all these cells are of mesenchymatous origin; they are large monocytes and possess identical physiologic properties.

While they are originally found in certain predestined organs they may also be reproduced by metaplasia out of the cells of other structures, preferably the adventitia of blood vessels. The whole system is in a permanent stage of regeneration.

The physiologic properties of these cells are manifold and of great somatic dignity. They have a decided migratory tendency and transitory capability.

They are attracted to any area of increased metabolism, and are also able to penetrate the walls of blood vessels, thus entering the blood stream.

They are always ready for phagocytic action and are able to take up materials either in particulated aggregation or in solution.

Another of their characteristic qualities is their capacity of storing materials and eventually disintegrating them.

It was also noticed that the storage of one substance does not prevent their successively taking in materials of a different character. In fact the imbibition with certain proteins stimulates the functional capacity of these cells; the same holds good of moderate heating. Sudden flooding of these cells with toxines of streptococcic origin causes their death.

The cells of the reticulo-endothelial system are intimately connected with all phases of immunization and they are capable of producing defensive ferments.

For the diagnostic recognition of these cells the discovery of intravital staining was of highest importance. Stains that are of anodal convection, that travel toward the anode, are the stains of predilection of these cells.

Functioning cells store these stains in the conductive canaliculi only and not in their parenchyma. A thorough staining of the entire cell body reveals necrobiosis of the cell.

For the visualization of the imbibition of these intravital stains a direct biopsy is feasible only if tumors or other parts of the body are removed after the stain was injected into the circulation. In all other instances an indirect method has to be employed. A qualified amount of the stain is injected intravenously and the time of its disappearance out of the blood is noted. The rate of this subsidence permits of conclusions concerning the functional integrity or deficiency of the reticulo-endothelial system.

Appreciation of the functional dignity of this system clarifies many pathologic and therapeutic problems within the range of genitourinary work.

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Testing the reticulo-endothelial system by the method mentioned above offers a chance of gauging the individual resistance of a patient.

The disintegrating capacity inherent in these cells is one factor that helps explain the failure to produce permanent results by transplantation of gonades.

The efficacy of medical diathermy in inflammatory infiltrations of prostate, epididymis and seminal vesicles finds a ready explanation in our knowledge of the activity of the reticulo-endothelial system.

The immigration, local neoformation and multiplication of the macrophages in the area of heating and subsequent hyperemia enhances the detoxifying of the structures involved and paves the way for the restitution to normality. The fact that moderate embodiment of foreign proteins stimulates the functional capacity of the reticulo-endothelial cells explains the efficacy of the aseptic protein shock in such instances.

The numerical increase and the energizing of the macrophages within the perithermic zone produced by electrocoagulation of tumors emphasizes the curative importance of this area. The stimulated macrophages in this region are not only able to attend to the particulated destruction of the remaining tumor cells but they are also known to produce defensive ferments.

During pregnancy the highest demands are put on the eliminatory and defensive forces. Not only is the metabolism of the entire system permanently increased, but into the circulation enter also the additional end-products of the placentar and embryonic metabolism.

It was found that in a great many pregnant women, especially in the later stages of gestation, the efficiency of the reticulo-endothelial system is considerably impaired. Then the eliminatory system works under a double disadvantage, increase of the metabolic slags and weakening of the defensive forces. Preexisting minor pathology may be aggravated and new renal disturbances may be created.

Edema and hyperplasia of the upper urinary tract as a regular concomitant of pregnancy furnishes an area of minor resistance. This, together with the impairment of the defensive forces, explains how pyelitis during pregnancy may assume an insidious and stubborn character or how originally minor obstructions of the upper urinary tract may develop in severe and permanent involvements as demonstrated by Danforth and Corbus.

The recognition of the pathology and pathologic physiology of nephritis together with our knowledge of the functions of the reticulo-endothelial system furnishes valuable pointers.

Nephritis is the local manifestation of a toxicosis of the general and renal capillary system. The subsequent deterioriation of the capillaries not only interferes with the proper elimination of the end-products of the organic metabolism but produces also other irregularities. Unimpeded influx of toxines eventually leads to an excessive permeability of the capillary walls manifested by toxic transudation, to nephritic edema and to diapedesis of red blood cells.

Detoxifying the capillary system helps restore its eliminatory functions and the convalescence of the capillary walls prevents further transudation and hemorrhage.

This detoxification is the task of the reticulo-endothelial cells and it is rational to stimulate their efficacy before extended toxicosis produces irreparable destruction in the eliminatory system.

The most potent agents for raising the defensive power of the reticulo-endothelial system are medical diathermy and the administration of the aseptic protein shock. A timely application of these methods will necessarily improve the therapeutic results.

THROMBOSIS OF THE HEMORRHOIDAL VEINS*

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MULTIPLE thrombosis of the superior hemorrhoidal veins, usually referred to as acutely strangulated piles, is seen fairly frequently by every proctologist. It is the cause of much acute suffering and of a temporary invalidism. It is commonly thought that the internal hemorrhoids have protruded through the external sphincter and that this muscle has then gone into spasm, thereby cutting off the circulation of the hemorrhoidal tissues, and thus has given rise to a condition analogous to strangulated inguinal hernia.

This conception is manifestly incorrect. There is never the slightest difficulty in inserting one, two, or at times even three fingers through the external sphincter alongside the protruding hemorrhoidal mass, which procedure would be impossible were spasm present. In fact, the sphincter in this condition is in a state of partial paralysis.

In internal hemorrhoids without thrombosis the cardinal symptoms of prolapse and bleeding may be absent for variable lengths of time. Suppositories and pile ointments are used by individuals with reported cures. Of course, the pathology is still present; it is simply the symptoms that have been alleviated. It seems reasonable to suppose that the inconvenience to the patient is due not to the piles per se but to the associated low grade infection. Applications of various sorts and other non-operative procedures, such as divulsion, probably mitigate this infection and give a temporary improvement in the patient. When an increased infection is superimposed on these already diseased vessels, the weakened endothelial lining breaks and acute thrombosis results.

Pathologists differ greatly as to the causation of venous thrombosis. It has been held that the condition is due entirely to an alteration in the velocity of the current of blood, in addition to changes in the blood pressure, and that the bacteria which are present in the clots were brought there subsequent to the clotting. However, it is admitted that traumatism to a vessel wall will quickly produce thrombosis. Disease of the wall, due to bacterial infection, will produce a traumatism as does an externally applied force, and with the same result. It is the writer's belief that this is the etiology of acute thrombosis in the superior hemorrhoidal veins.

It is possible that strangulation may be a factor to a limited degree. Prolapse occurs constantly and is replaced regularly with attendant traumatism. At some time a prolapsed and diseased vessel ruptures, forms a clot and thereby increases the size of the mass protruding through the ring of sphincter muscle. As blood continues to pour into this enlarged mass the sphincter may constrict the latter and thrombosis occur throughout as a result. Then the muscle itself would lose its tone, due to continued pressure and long-standing disease and the usual picture would be quickly presented.

The writer has never seen this general thrombosis of the superior hemorrhoidal vessels without an accompanying general thrombosis of the inferior hemorrhoidal veins. The typical picture is of large mass outside of the anus sloughing and discharging freely and early accompanied by a great deal of pain.

When called to see one of these cases, the first thought of the surgically minded man is to operate at once, and this procedure is common, sometimes with dire results. The superior hemorrhoidal veins

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empty into the inferior mesenteric and thus into the portal system. The lymphatics empty into the prevertebral lymphatics. Operative procedures in the acute stage stir up and spread the existing infection with a possible formation of a liver abscess. Even death has resulted from generalized infection.

The better plan of treatment is to put the patient at absolute rest in bed and upon a restricted diet. A wet compress of boric acid solution, either hot or at room temperature, is comforting to the patient and assists in promoting absorption of the clots. If the pain be great, morphine may be used either hypodermatically or by mouth. Opium suppositories are contraindicated here and at any other time. Opium has no local action and may be irritating in a suppository.

Sloughing may go on to a spontaneous cure of the hemorrhoids. If this should not occur, the hemorrhoids may be taken off by any appropriate operation, or they may be treated by the injection of 5 per cent quinine and urea hydrochloride solution after the clots have been absorbed and fibrosis has occurred, and when all acute symptoms have subsided, which period usually is not under three weeks from the onset of the acute disease.

If operation be resorted to in the acute stage a stormy convalescence may be looked for, provided the operator is fortunate enough not to have a more serious result. When the conservative method of treatment is generally followed, a few patients will get into the hands of the more radical operators and a few others will recover without the need of any operative procedure, but the final result in the case will be better. The conservative surgeon will have no fear of losing his patient to the mortician and he will not be likely to lose sleep because of any resultant emergency night call.

LABORATORY CRITERIA IN TREATMENT OF LOCAL & GENERAL INFECTIONS FROM A SURGICAL STANDPOINT*

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IN dealing with the subject of infection a simple terminological classification of the phenomena of infection on the following basis seems advisable:

1. The term infection should be used as a generic one and should include all of the phenomena of a bacterial attack on tissue, organ or the entire body and should be delimited by reference to the tissues, organ or part of the body involved, and in accordance with the organism or organisms encountered; thus, staphylococcus infection of the skin, or streptococcus infection of the liver, etc.

2. The term "bacteriemia" should also be used in a generic sense to indicate any condition in which bacteria can be cultivated from the peripheral blood during life, and should be described further in accordance with the organism found; thus staphylococcus bacteriemia, streptococcus bacteriemia, etc.

3. The term "general blood infection" may be employed to indicate a subgroup of the generic term bacteriemia in which the faculty of destroying the circulating bacteria is more or less lost by the appropriate antibodies of the blood, and in which, in addition, a multiplication of the bacteria takes place in the circulation.

Under appropriate circumstances both of these groups of terms should be employed together; thus staphylococcus infection of the skin with staphylococcus bacteriemia or general blood infection. The character of the local lesion in the complete development of any individual infection is best described by the use of the terms primary or secondary (metastatic, subsidiary); thus primary staphylococcus infection of the skin with staphylococcus bacteriemia, or primary steptococcus infection of the tonsil with secondary streptococcus infection of the appendix, etc., the absence of any descriptive bacteriemia indicating that a cultivation of the peripheral blood made during the course of the illness was sterile.

In clinical practice infection of the human body appears in one of the following forms:

1. A local lesion is present apparently without any constitutional symptoms. This must necessarily mean that the amount of constitutional disturbance is so small as not to be perceptible to the affected person or recognizable to a competent examining physician. The best examples of this type are the small furnucles that occur on the back of the neck.

2. A local lesion is present with general constitutional symptoms. The latter show an infinite number of variations both in degree and in kind, and the manifestations may be very severe and may terminate in the death of the individual. Positive blood cultures are not demonstrable.

3. Cases similar to those in Group 2 but in which living organisms can be demonstrated in the circulating blood. The bacteriemia may or may not be a temporary phenomena; the organisms may be present in the blood in cases that go on to recovery and may disappear from the circulation in cases that later end fatally.

4. Cases in which secondary lesions appear. Living organisms may not be demonstrable in the circulating blood, or may be demonstrable as a temporary or

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permanent phenomenon; may be present in comparatively small or in overwhelming numbers; may be demonstrable in cases that go on to recovery, and may be absent during the entire course of the illness in cases that go on to a fatal termination.

5. Cases in which a bacteriemia or general blood infection exists but in which a local focus is not demonstrable.

There is a continuous contact between the various surfaces of the body and bacteria of all kinds. For this purpose the surface of the body should be considered to be not only the external skin but also the mucous membrane lining the entire extent of the alimentary canal, the entire lining membrane of the urogenital tract and of the pulmonary system. The epithelial lining of the ducts and the alveoli of all glandular structures in direct connection with any of these tracts is also an external surface of the body as far as the introduction of infection is concerned. The conjunctiva of the eyes is also an external surface. This is but an extension of the universal law throughout living matter that no relation can exist between living matter and its environment except through its surface.

It seems to be true that, even during states of health, traumas of one kind or another are constantly occurring to the major surfaces of the body (the skin or the intestinal mucosa) and that through these breaks bacteria of one kind or another are constantly entering the body. The protective forces of the body are, however, so strongly developed that interaction of bacteria or of their biologic products and surface cells is prevented or, what is more often the case, the effects of this interaction are immediately neutralized and the bacteria that enter are immediately destroyed. No perceptible effect is clinically demonstrable in the tissues either immediately or subsequently, and the condition of health continues undisturbed. This protection is a constant one during health.

I am strongly of the opinion that the assumption sometimes made, that bacteria can pass through an intact healthy body surface, is an incorrect one. I believe, as far as the external skin and the mucosa of the alimentary canal are concerned, that no entry of bacteria can take place without the intervention of some trauma, however minute it may be. Even in the presence of trauma, it is only in extraordinary instances that the natural protection breaks down and disease ensues, either because the opposing bacterium is one of extraordinary virulence, or because the character of the infection is one to which the natural antibodies have previously, either in the individual himself or in his race, been not at all, or insufficiently, developed. Anthrax infection and the incidence of unaccustomed diseases in savage, aboriginal or other similar races make excellent examples of this point.

Absorption of bacterial toxins from any primary lesion on a body surface occurs by way of the lymphatic system and by way of the blood stream. Penetration of the infecting bacteria into the body occurs also either through the lymphatic stream or through the blood stream. Both forms of communication are always necessarily present in all forms of infection. In certain classes of infection, especially those of the skin and of the distal parts of the extremities, the preponderance of the lymphatic form gives rise to the typical clinical picture known as lymphangitis. In the latter form of infection the progression of the process from its portal of entry is a continuous one along the lymphatic channels, and the spread of the infecting bacteria into the body is a continuous penetration and growth along the lymphatic channels. Infections entering through accumulations of lymphadenoid tissue, notably the tonsils and Peyer's patches, are typical forms of lymphangitis as thus defined, and the progression of the infection along the lymphatic channels can be frequently demonstrated clinically in the secondary involvement by continuity of the regional lymph nodes in connection with these

surface areas. In all forms of lymphangitis it is not possible to cultivate living organisms from the peripheral blood stream during the duration of the infection.

A differentiation commonly made between local and gereral forms of infection does not, theoretically, exist. Every local infection must necessarily have some general effect and every general infection must at some time have been associated with a local focus from which it was derived. The distinction is one more of convenience than of accuracy.

Penetration of the infecting organisms from the portal of entry into the rest of the body occurs by way of the blood stream and is intimately associated with the subject of venous thrombosis. The protective (inflammatory) process associated with any infection has as one of its prominent characteristics the slowing of the blood stream and the formation of venous thrombosis. The growth and multiplication of the bacteria in the focus of infection occurs in the thrombotic areas where in a relative way they are mechanically blocked from further progression, at least temporarily, by the occluding thrombus. However, the bacteria find an excellent culture medium here, and unless their powers of further growth and development are destroyed by the natural forces of the body, they continue to multiply and to penetrate the clot until they reach the surface of the thrombus, where the bacteria come into contact with the freely circulating blood in a connecting of the vascular channel. A number of possibilities develop as a result of this biologic progression:

1. The thrombi form a sufficient barricade and successfully localize the bacteria away from the circulating blood. Under such conditions no bacteria can be demonstrated in cultivations of the peripheral blood.

2. The growth of bacteria on the surface of the thrombus in contact with the circulating blood results in numbers of the bacteria being thrown off into the blood stream. In some cases the bacteria destroying powers of the blood are sufficient to kill the organisms as fast as they are thrown off, and in these cases positive blood cultures are not obtained. In other cases the bacteria-destroying powers of the blood are only sufficient to kill the organisms a little less quickly than they are shed into the circulating blood. Positive blood cultures are then obtained but the number of organisms demonstrable in the peripheral blood remains small and the bacteria do not appreciably increase in numbers in successive blood cultivations. In practice recovery is possible and frequently occurs from such forms of bacteriemia. The best examples of this are the milder bacteriemias associated with osteomyelitis and the cases of sinus thrombosis after middle-ear infection with mastoid involvement.

3. The growth of the bacteria on the surface of the clot in contact with the freely circulating blood is unhindered by any bacteria-destroying powers and the organisms accumulate rapidly in the blood. In this form also the bacteria multiply in the blood stream itself. These cases are hyperacute forms of general blood infection and are almost invariably fatal. The commonest example of this is the fulminating form of general blood infection associated with severe forms of osteomyelitis and infections by the bacillus of anthrax.

Under any of these three conditions the thrombi in the focus of infection contain living bacteria. Under any of these three conditions pieces of the original thrombus or clumps of bacteria break off and are swept away in the circulation to all and any distant or near part of the body. Such vascular or bacterial emboli form the cause of any and all secondary lesions. Clinically the discharge of such "showers" of bacteria into the free circulation are frequently accompanied by chills.

The location of the secondary foci are determined by the arresting of the emboli at some point or points of the vascular network; and the actual point depends sometimes on an external trauma but more

often it is described by the physics of the local capillary circulation, or by the anatomic peculiarities of the local vascular network, or by mere chance. Various pathologic pictures result, depending on the organ or tissue in which the embolus lodges, the size of the plugged vessel, the relative position of the plug, the facility and faculty for vascular anastomosis and collateral circulation in conjunction with the character and virulence of the organisms, and the general powers of resistance of the subject as a whole. Most typical pictures are obtained in osteomyelitis and in the metastatic furuncle of the lung. The dominant characteristics of the pathologic pictures of the secondary foci are (1) a thromboarteritis or thrombophlebitis, and (2) more or less necrosis consequent to disturbance of the local circulation. In certain tissues such as bone, the necrosis plays a dominating rôle in determining the pathologic picture: in certain others, as in the lung, this is a negligible factor.

These secondary foci can and do occur in any tissue or organ of the body. Bones and joints, the lungs and the kidneys are possibly the commonest locations in which secondary foci develop. The most important location, from the gravity of the complication which it produces, is the endocardium and heart valves.

Character of Organisms Found on Culture. Facts obtained by studying cultures of purulent or other material (exudate) obtained from a demonstrable local focus of infection frequently serve valuable purposes. The information can be classified as follows:

A. The mere presence of organisms in the exudate serves as a means of diagnosis. The best example of this is the finding of pyogenic or other organisms in spinal fluid.

B. The character of the infecting organism frequently serves as a means of differential diagnosis and at the same time helps materially in establishing the prognosis, that is, the demonstration of anthrax bacilli in an otherwise indifferent-looking lesion changes the outlook to an extremely grave one. In other instances the character of the organism becomes important when the lesion is in a given tissue, that is, the presence of Welch bacilli in a focus of infection in muscle tissue makes an otherwise favorable prognosis potentially fatal. Cases are constantly being seen in which it is difficult to decide whether a focus of infection has localized in a bone or in an adjacent joint. True enough, this sometimes indicates a simultaneous involvement of both, but in other cases the localization is hidden in a general inflammatory reaction. Under these circumstances, the demonstration of organisms of the staphylococcus group, Staphylococcus aureus especially, indicates that the chances are greatly in favor of an involvement of the bone; the demonstration of organisms of the streptococcus group would speak in favor of an involvement of the joint. The differentiation carries with it a possible therapeutic indication. Other things being equal, the demonstration of organisms of the staphylococcus group with its consequent interpretation of a lesion of the bone would ordinarily favor exploration of the bone in cases of doubt; while the demonstration of organisms of the streptococcus group would indicate a more conservative treatment, at least as far as exploration of the bone was concerned.

C. Recently abdominal puncture has been practiced in cases of general peritonitis, either as a method of diagnosis in doubtful cases or as a means of differentiating a pneumococcus or streptococcus peritonitis. When these organisms are demonstrable, it indicates that the peritonitis is a metastatic one and is unassociated with a definite focus of infection in an intra-abdominal viscus which is amenable to surgical treatment; the prognosis then becomes extremely grave; the usual custom is to refuse to operate in these cases.

D. In infections of the middle ear the demonstration of a mucoid encapsulated coccus is commonly accompanied by a rapid destruction of tissue, which is unac-

companied by perceptible clinical or other evidence. Exploration of the mastoid is then indicated, although with other types of bacteria operation would not be considered.

Clinical Classifications. Blood cultivations of the peripheral blood can be employed in cases of acute infection for the following purposes: (a) in appropriate cases as an additional means of differential diagnosis; (b) as a means by which the severity of the infection can be gaged; (c) as a help in estimating the prognosis; and (d) as criteria on which to base the primary or further operative treatment.

A relative quantitative estimation of the magnitude of the infection can be established according to the number of colonies of bacteria which appear on the plate (plate culture method) in proportion to the amount of blood used to inoculate the culture medium in the plate; thus, 1 or 5 colonies of bacteria per cubic centimeter of blood as compared with 100 or with an uncountable number of colonies of bacteria per cubic centimeter of blood. This is a rough method and is not strictly accurate, but for practical purposes the inaccuracy is inconsequential.

In practice the presence or absence of bacteriemia or general blood infection and its relative magnitude yield the following clinical groupings, and the correct interpretation of the bacteriemia in its relation to the clinical manifestations yields certain therapeutic indications:

A. Cases in which the blood cultures are sterile. Good prognoses should be the rule under these circumstances, and the method of treatment should be planned with regard to the local focus of infection only. A reservation should be made in one's mind, however, to cover those cases of acute infection in which, for some reason the thrombophlebitis begins to spread; in these cases positive blood cultures may be obtained later, and the character of the illness may change entirely for the worse.

B. Cases in which the blood cultures yield approximately from 1 to 5 colonies of organisms to the cubic centimeter of blood are usually, but not always, of a mild nature, are associated with symptom complexes which do not differ materially from those in similar cases in which the blood cultivations are sterile, and frequently disappear spontaneously or after operation. Good prognoses are the rule in these minor bacteriemias, and the method of treatment usually can be planned without regard to the bacteriemia.

C. On the other hand blood cultures can be obtained in which the numbers of colonies are extremely large, 100 or more colonies to the cubic centimeter of blood. This always indicates a severe infection and an extremely grave prognosis. The clinical picture commonly shows an equal evidence of the severity of the infection.

Any kind of local condition may be associated with such a general infection.

This group contains those fulminating forms of bacteriemia and general blood infection in which a demonstrable local focus of infection is of minor consideration and in which the general blood infection is the dominating factor in the entire clinical picture. Under these circumstances, treatment directed to the local lesion is clinically futile, and fatalities are the rule and not the exception. The uselessness of even the most radical surgical procedure is usually easily recognizable by the overwhelming rapidity with which the clinical picture passes into one of terminal delirium, coma and death.

There are other somewhat less severe forms of acute infection in which the blood also contains large numbers of viable organisms, but in which the clinical picture does not carry with it that comparatively sudden overwhelming of the body with a profound toxemia. A somewhat more hopeful attitude can be entertained in these cases, and whenever the local conditions make it possible, the question of radical surgery should be discussed in the hope of controlling the bacteriemia by removing the local focus from which it derived.

D. Between these two extremes are large

numbers of cases in which the cultivation of the blood shows an intermediate number of colonies of bacteria. Correct judgments are more difficult in these cases. Usually an aggressive policy is indicated, and whenever possible operation should be performed with the object of removing the thrombophlebitic lesion from which the bacteriemia is derived. Thereafter watchfulness and repeated blood culture studies are necessary. A careful study of the latter permits certain deductions of therapeutic value.

In cases of this kind, when a given blood culture is compared with subsequent ones taken on the same patient, decrease in the number of colonies or their disappearance undoubtedly indicates improvement when other conditions are equal; an increase in the number of colonies should always cause alarm, a prompt reconsideration of the available clinical picture and revision of all of the demonstrable foci according to rules that I shall give. Comparisons made along these lines are of extreme usefulness and importance at the bedside and in the operating room.

In the presence of a positive blood culture a prognosis of the ultimate outcome should not be attempted except after consideration of all the available clinical facts. While a positive blood culture is always serious, the seriousness of the possibilities is usually paralleled by the characteristics of the clinical picture. The prognosis should always be guarded. Much depends on the availability of the local focus of infection for thorough surgical removal, and on its removal before other complicating foci have appeared, and on the presence or absence of an endocarditis. Much depends also on the patient's resistance. Instances repeatedly occur in which individual antibacterial powers are sufficient to overcome the demonstrable bacteriemia, so that at no time, in the absence of evidence of a fulminant and overwhelming infection as previously mentioned, or in the absence of an endocarditis, should a hopeless attitude be entertained.

Negative Blood Cultures. Negative (sterile) blood cultures obtained either primarily or secondarily should always be associated in one's mind with the milder type of infection or with improvement. The contrary may be true and negative blood cultures may occur in the presence of the most profound infections. The most important groups in which negative blood cultures are obtained as a rule include infections of the lymphangitis type and infections in which the path of absorption lies through the portal area. It must also be remembered that negative blood cultures may indicate only a temporary bacteriemia, that is, interval between others in which bacteriemia is present. In clinical practice temporary bacteriemias can be unintentionally produced by operation and other manipulations, as for example, in the dressing of a wound, notably a wound of the bone, the passage of a sound into the bladder and other procedures. The lesson to be learned is that manipulations of the kind should be practiced with great care and circumspection, and should be avoided altogether if possible. Unnecessary and unwise squeezing and other treatment of lesions, notably of furuncles and carbuncles, especially of the face and upper lip, may convert a seemingly innocuous lesion into a fatal one complicated by a thrombophlebitis of the facial vein and of the cavernous sinus.

Gravity of the Local Lesions Apart from Bacteriemia. In the presence of positive and negative blood cultures a progressive impoverishment of the general condition of the patient and an ultimate fatality are frequently due to the magnitude and number of the various points of fixation that have occurred or to their location in important viscera or localities of the body rather than to the presence of the blood infection.

Relation of Local Lesion to Bacteriemia. In any given case a demonstrable bacteriemia may be referable to the original primary lesion at the portal of entry of the infection or to any secondary or subsidiary focus of infection. Because of the throm-

bophlebitis which is produced at the point of fixation, secondary foci can also give rise to a bacteriemia; these include especially foci of osteomyelitis and a bacterial endocarditis.

Primary bacteriemias are more commonly demonstrable and recognizable as such in cases of infection by specific organisms, as, for example, the gonococcus bacteriemia accompanying an acute gonococcus urethritis or the pneumococcus bacteriemia accompanying a pneumococcus pneumonia of the lobar type. Somewhat less commonly the primary bacteriemia is recognizable as being due to the original primary lesion because the latter is available for discovery and observation on an exposed surface of the body, as for example, the bacteriemia which accompanies a carbuncle or furuncle of the skin or that which accompanies streptococcus tonsillitis. Sometimes both of these factors, the specificity of the organism and the location of the lesion on a surface of the body, favor the recognition of the primary bacteriemia as such; as, for example, the bacteriemia which accompanies an anthrax lesion of the face or the bacteriemia which accompanies typhoid fever, in which the portal of entry is on the mucous surface of the ileum and the primary lesion is in Peyer's patches. Except under these specific conditions the available instances in which the demonstrable bacteriemia can be recognized as primary and as being derived from the primary lesion at the portal of entry seem to be in the minority.

In other cases distinct primary and subsidiary lesions coexist and are associated with a demonstrable bacteriemia. Then it is commonly difficult to say whether the demonstrable bacteriemia is derived from the primary or from the secondary lesion. The best examples of this difficulty are found in conditions of the ear in which a primary lesion is found in a complicating thrombosis of the lateral sinus, and secondary lesions are found in a bone or in a joint. Here the primary lesion remains a constant factor even in the presence of subsidiary foci which can themselves originate bacteriemias. Even after the jugular vein has been efficiently tied, a bacteriemia may still be derived from extension of the primary thrombus along the petrosal sinuses, and it is a nice distinction to integrate a bacteriemia properly between a subsidiary focus elsewhere in the body and the primary lesion in the lateral and petrosal sinuses.

Lastly, in still other cases a focus of infection is present which is distinctly a metastatic lesion, and which is accompanied by a bacteriemia. In the one group of such cases a primary lesion is sometimes demonstrable as a definitely healed lesion. A common example of this clinical fact is found in cases of acute hematogenous renal infections (hematogenous multiple renal infarcts); frequently, indeed, the site of the original furuncle is still recognizable in a recently healed scar. In the second and much more common group of these cases the primary lesion is undemonstrable. The commonest example of this status is found in cases of acute osteomyelitis. In the presence of any of these combinations experience leads one to assume that for clinical purposes all of these bacteriemias should be associated with the demonstrable metastatic lesion. Fairly complicated situations can and do arise, and the explanation of the bacteriemia becomes a matter of exclusion when several foci of infection coexist.

LABORATORY CRITERIA FOR THE TREATMENT FOR THE LOCAL LESION

Treatment for the local lesion should be based upon a consideration of all the facts outlined in this discussion. Multiple foci should be treated individually along similar lines and in accordance with the points of view expressed.

A. Other things being equal, the absence of a demonstrable bacteriemia or general blood infection indicates that a conservative attitude can be assumed in deciding the correct method of surgical treatment of the local focus. The immediate important

results of this conservative attitude include: (1) the performance of a much less severe (frequently a minor) primary operation; (2) much less chance of the spreading of the thrombophlebitic or thromboarteritic process with all the consequences outlined; (3) frequent conservation of important organs or tissues; (4) frequent avoidance of unnecessary complications.

B. Other things being equal, the presence of a demonstrable bacteriemia or general blood infection indicates a dangerous and possibly progressive lesion; it also indicates that an urgent effort, commensurate with the severity of the infection, should be made to remove the local focus as early and as completely as possible before the spreading infection does irreparable damage to the endocardium or to some important organ or locality. All the information classified in the previous part of this and in other papers as regards the clinical and therapeutic significance of a bacteriemia or general blood infection should be considered at this time and judgments formed and indications met accordingly. The important indication is to remove the local focus of infection as completely as possible. Conservative treatment should be replaced by radical removal of tissue into healthy areas in an attempt to reach a point distal to the thrombophlebitic lesion. There are times and localities in which radical removal of the thrombophlebitic focus is not technically feasible; under these circumstances, as much as possible should be done in this direction and the rest must be entrusted to nature's efforts to dissipate the bacteriemia spontaneously.

POSTOPERATIVE INFECTION

The phenomena associated with and accompanying a bacteriemia sometimes occur after operation (so-called "operating room infection") in divers parts of the body. Such infection does not always predicate an introduction of organisms from without. The bacteria may come from unrecognized foci of infection pre-existing in the body, as, for instance, in the tonsils; the wound then becomes a secondary focus.

As a general rule postoperative infections with demonstrable bacteriemia are extremely serious and usually terminate fatally. Clinically the patient has high fever and chills; the chills usually occur at irregular intervals whenever swarms of bacteria are being sent into the circulation. The local area of the operative wound need not necessarily show more evidences of change than are seen under more happy circumstances, and it is always impossible to discover any other focus of infection which could account for the bacteriemia.

In certain areas of the body and after certain operations, for instance in the pelvis and after amputations of the breast for carcinoma, the proximity of large veins to the operative field should make one suspect that the circumstances outlined in the foregoing paragraph are associated with an infected thrombosis of the adjacent vascular channels. Exploration of these venous channels is urgently indicated; when the thrombi are found, these should be removed and the veins tied on their distal side. The latter operation will succeed in direct proportion to the shortness of time during which the thrombi has been allowed to feed bacteria into the blood stream; success will not always follow when secondary foci have been established, and never when the endocardium becomes secondarily involved.

NEW INSTRUMENTS

A CLOSED ASEPTIC AND QUICK METHOD OF GASTROINTESTINAL ANASTOMOSIS*

A PRELIMINARY REPORT

A. V. PARTIPILO, M.D.

CHICAGO

THE trend of surgical procedure within the abdomen is slowly being changed from the open to the closed and aseptic method of anastomosis. The open method of gastrointestinal anastomosis is attended with a certain amount of postoperative complication and with fatalities that are directly due to spilling of contents or contamination from the opened bowel. Perfect asepsis in an operation is of utmost importance for the welfare of the patient, and it is the ideal for which the surgical profession has been striving. It cannot be obtained with ordinary precautions that prevent infection due to extraneous causes. An operation should be carried on aseptically to its completion, and this cannot be done with an opened stomach or intestine.

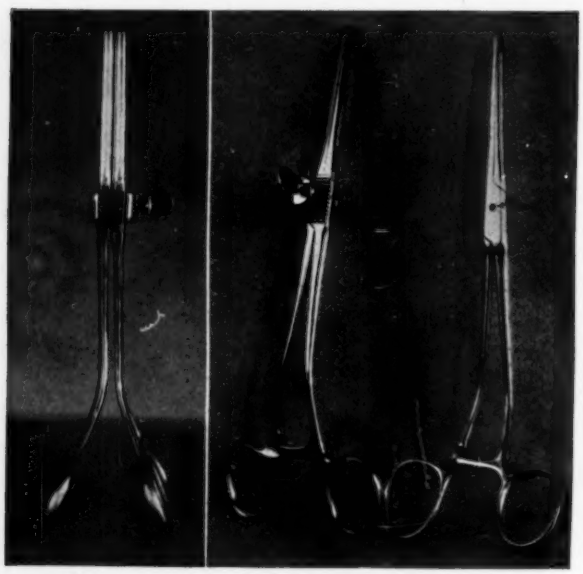

FIG. 1. FIG. 2.

FIG. 1. Two angulated 8 in. forceps held together by a metal U clamp with nut. Jaws are 23 cm. long and 5 mm. wide.

FIG. 2. A. Set screw attached to the forcep. Arrows point to cerrations upon the box lock on the inner surface of the forceps. These help to hold the forceps together when locked. B. Arrow points to groove upon box lock to fit nut of the set screw.

With the forcep which I have devised it will be possible to perform any type of anastomosis with perfect asepsis. It embodies the principle of a closed method of anastomosis, thereby eliminating the possibility of spilling of the contents and also preventing contamination. C. A. Perret[1] of Berne, Switzerland and F. W. Rankin[2] of the Mayo Clinic have each devised an instrument for a closed method of anastomosis. The former uses a single instrument made up of forceps of various sizes, which he calls invaginators. Rankin's is a three-bladed clamp with the center blade fixed. They both have reported favorable results with the use of their instruments and claim that the closed method is advantageous over the open method.

The author's forcep can be used in any type of anastomosis with this exception: it cannot be used after a wide resection of the stomach. It is of special value in resecting an ulcer of the stomach or duodenum. This cannot be done with the Rankin clamp nor with Perret's invaginators. Experiments are now being conducted by

[1] Perret, C. A. *Surg. Gynec. & Obst.*, 44: 378, 1927.

[2] Rankin, F. W. *Ibid.*, 47: 78, 1928.

* From Surgical Research Department, Loyola Univ. School of Medicine. Submitted for publication Nov. 30, 1928.

L. D. Moorehead, W. J. Pickett and the author upon the following operat ons: Resection of gastric and duodenal ulcers, gastroenterostomy, lateral anastomosis, end-to-end anastomosis and end-to-side anastomosis. The greater part of our experiments are resection of ulcers and gastroenterostomy, because these have not been experimented upon utilizing the principle of closed method of anastomosis. If the experiments substantiate the principle involved in the forcep this will be indicated whenever an anastomosis is required. It will eliminate postoperative peritonitis and reduce operating time to one-half of that consumed by the standard methods.

The instrument is composed of two separate 8 in. forceps which when brought together are held by a set screw. The jaws are 23 cm. long and are grooved in the inner surface to prevent slipping of the tissues. The handles are angulated to permit freedom of movement and handling. The results of the experiments and the technical procedure for the various operations will be described in a future article.

SAW HORSES INSTEAD OF CRUTCHES*

Jason S. Parker, M.D., F.A.C.S

WHITE PLAINS, N. Y.

THE illustration is self-explanatory. This is a simple, practical method of assisting old people to regain the use of their limbs after long confinement in bed with a fracture. Any carpenter can make a saw horse. The hand rail is about 30 inches long and of convenient height from the floor. The feet are about 12 inches apart and are placed at an angle. If made of oak they are light and strong. The patient is taught to take steps of equal length and he does not get into the habit of limping. He walks between parallel bars which inspire confidence because they are firm and do not upset. Mrs. B. fractured her femur May 24 and the picture was taken September 10, 1928, on her eightieth birthday.

* Submitted for publication November 1, 1928.

Fig. 1.

DEMONSTRATION OF TABLE FOR CYSTOSCOPIC AND ROENTGEN-RAY PROCEDURES*

Paul W. Aschner, M.D., F.A.C.S.

NEW YORK

THIS table under consideration was devised to fill the urologist's daily needs without unduly straining his purse and without duplicating accessories which he probably possesses.

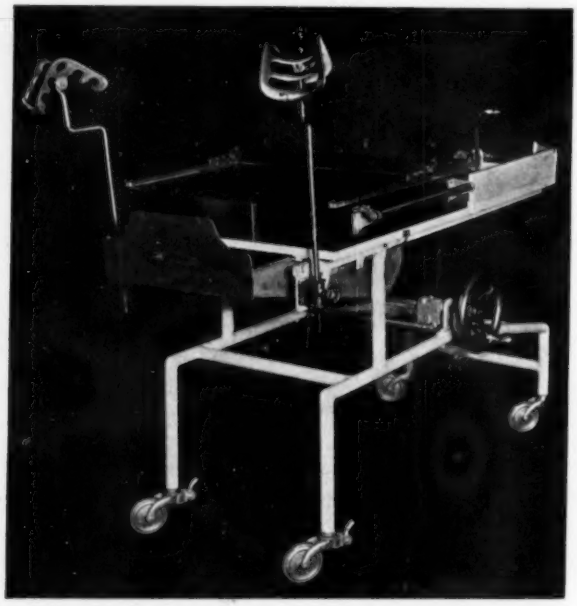

Fig. 1. Cystoscopic roentgen-ray table.

It consists of a flat Bucky diaphragm set in a frame with an adjustable monel metal back rest attached. The whole is mounted on a long well balanced base in such a manner that the patient can be tilted 45 degrees in either direction by turning one wheel. This is adequate to establish mobility of the kidney by pyeloureterograms made under cystoscopic visual control, the method of choice. The patient is placed on the diaphragm, the cystoscopic manipulations completed and the roentgen ray work done without having to move the patient at any time.

Bierhoff type of leg holders, very simple, adjustable, are provided. An unusually large deep drain pan is attached in such a manner and of such construction as to protect the operator, the floor, and the table.

No tube stand is attached. I believe that a fixed attached stand is not compatible with the highest degree of protection against accidents. Moreover it does not permit of a varied stereoscopic technique, nor of the use of small films for detailed study of selected areas.

No irrigating stand or illuminating rheostat is attached; each of you has his own preference in these details, and the equipment for it.

An easily attachable leg piece is provided whereby the table is immediately converted into an ordinary examining or roentgen ray table for general use.

The whole unit is mounted on large lockable wheels and so balanced that it is mobile or fixed as one pleases.

* Read before the Section of Genito-Urinary Surgery, N. Y. Academy of Medicine, Oct. 17, 1928.

RESORBABLE TAMPON

Hermann Kümmell, M.D.

HAMBURG-EPPENDORF, GERMANY

DURING the course of studies on cholecystectomy, the writer had occasion to make use of a catgut tampon which seems to offer definite advantages.

Every catgut ligature used for hemostatic purposes in the liver cuts the liver tissue. In order to avoid this, I have made use of a small tampon of specially prepared and shredded animal membrane, which is readily resorbable. The material itself is cotton-like in consistency and can be sterilized at 120°C. without being injured. I have made particular use of it in difficultly controllable hemorrhages on the surfaces of parenchymatous organs (liver, kidney, brain), and the fact that it is readily resorbable makes it very useful because the wound can be sewed up without drainage, resorption being completed in from eight to fourteen days. Even in cases which must be left open, I have found it very useful to put the resorbable tampon at the bottom of the wound so that when the gauze tampon is taken out the patient has practically no discomfort.

In infected wounds the tampon has been useful because when saturated with antiseptic material it is rapidly absorbed and the antiseptic released. This is naturally of advantage in various surgical procedures.

The process of resorption of the tampon has the following characteristics, as seen from microscopic sections made. A small-cell infiltration of the filamentous meshes of the tampon sets in from the edges of the living tissues after about twenty-four hours. This infiltration progresses slowly, until it has reached the very center of the tampon. As early as this there can be noticed a gradual disintegration of individual filaments near the edge of the living tissue. This process, after an initial acceleration, diminishes more and more in older sections, and finally they disappear from the picture altogether. Giant cells are often noted in young sections, but later they are no longer present. The formation of connective tissue is quite minimal and almost entirely confined to the surface of the wound. In case of moderately thick tampons, resorption can be looked upon as complete after a fortnight or three weeks.

It may be mentioned as a matter of history that attempts to gain a resorbable tampon date back to the 80's. When modern surgery was still in its infancy, Gluck tried to get hemostasis through massed catgut, but the material used by him was not really suitable for resorption. Jaeger and Wollgemuth made similar attempts before the war, as the author noticed on perusal of the literature; but even they did not get beyond the first stages of experimentation. Recently Vogel has obtained a fluid hemostatic tampon, suitable and indicated for purposes other than those in question.

* Submitted for publication September 14, 1928.

CASE REPORTS

LARGE LIPOMA OF THE BACK*

ADDISON H. BISSELL, M.D.

STAMFORD, CONN.

A LIPOMA may arise from connective tissue as well as from adipose tissue.[1] The "embryonic rest" theory gives a reasonable explanation of so many lipomas starting in tissue which normally contains no fat.

FIG. 1.

FIG. 2.

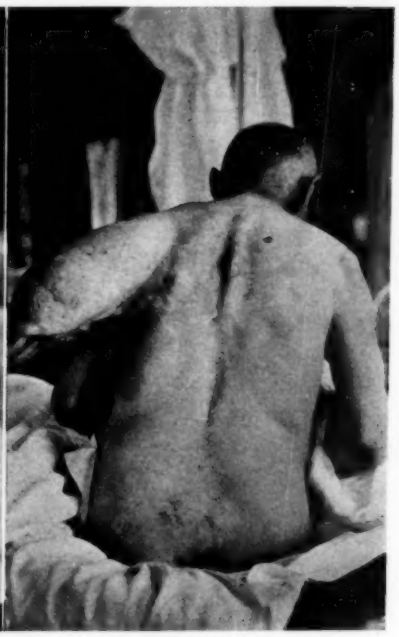

FIG. 3.

A lipoma is surrounded by a fibrous capsule, but is loosely attached to it. A very delicate capsule forms the surface of the tumor and is continuous with the areolar tissue forming the trabeculae of the tumor. Histologically the tissue of a lipoma resembles normal fat. Calcification, necrosis, gangrene and sloughing are common complications. These tumors do not produce metastases, but may be of multiple occurrence. There is general agreement that there is no malignant form, but that they are true tumors, as their fat is not reduced in the case of extreme general emaciation. They may grow to enormous size. Usually the growth is slow and gradual, though it may vary. If they occur in regions where traction is exerted by their weight lipomas tend to become pedunculated. If treatment is necessary because of deformity, ulceration or pain, surgical removal is indicated. The capsule is opened freely and the tumor enucleated from it. The separation is to be started inside the capsule.

[1] ZIEGLER, E. General Pathology. N. Y., Wm. Wood & Co., 1908.

CASE REPORT

A. S., male, aged seventy-five, No. 1764. Operated on March 14, 1925. From earliest

*Submitted for publication, December 6, 1928.

childhood two small tumors were present on the inner aspect of the left scapula. One began to grow slowly and by his nineteenth year had attained about one half its present size. From this age until he was seventy-three the growth remained stationary. During the two years before operation it doubled in size. For six months before operation there had been an area of ulceration near the tip of the tumor, the odor of which made him a most objectionable companion. With the ulceration he had run a slight intermittent temperature, lost some weight, tired easily, and shown an accentuation of the mental peculiarities which caused him to be called "simple-minded" all his life. Except for a mild arteriosclerosis, his general condition was good for a man of seventy-three.

Under ether the tumor was dissected free and its fascial attachment excised. For a week there was slight serum drainage from the lower angle. He was discharged cured in ten days, and a year and a half later was well, and there had been no recurrence of the tumor. The pathological report was lipoma. The mass weighed just under 20 lbs.

CHRONIC INTUSSUSCEPTION*

Fred W. Solley, M.D.

NEW YORK

Boy, ten months old, was admitted to the Babies Hospital January 5, 1928. C. C. Abdominal cramps and vomiting, one month's duration.

The pain was manifested by screaming and doubling up, and these attacks were very frequent during the first week, occurring several times a day, but during the last three weeks before admission they had gradually decreased in frequency. The vomiting was described by his mother as a spilling over of sour food recently eaten. This too was frequent at first, and decreased during the last three weeks before admission. The vomitus was never seen to contain any blood or mucus.

Stools were slimy from the onset, but his bowels *moved every day* up to admission, and were never constipated or very loose in character. Two weeks after the onset he had several very black tarry stools. One week before admission one or two drops of red blood were seen, but at no other time.

Previous history irrelevant. Birth normal. Birth weight 6 lbs. 9 oz. Nursed until eight months old. Always well in every way.

Physical examination on admission: Temp. 99°F. Pulse 100.

Fairly well developed but markedly emaciated white boy of about ten months, resting quietly and showing no evidence of pain or discomfort. The child looked somewhat dehydrated.

Except for large tonsils, the abdominal and rectal examinations showed the only positive physical findings.

The abdomen was rather scaphoid and soft and not in the least distended. A soft doughy elongated mass was very easily palpable in the left side of the abdomen especially in its lower two-thirds. The mass was movable, not tender, and seemed to be about 1½ in. in diameter or more, and at least 5 or 6 in. long. The upper and lower ends of the mass were lost on palpation rather than any definite termination being definable.

Rectal examination revealed a soft mass about the size and shape of a cervix but much softer. The mass was just palpable with the tip of the examining finger. On moving the abdominal mass the rectal mass moved also.

Laboratory findings: W.B.C. 12,200, P.M.N. 74 per cent, L. 26 per cent.

Urine: Acetone + + +, otherwise negative.

Because of the child's dehydration, and the fact there was no evidence of an acute obstruction, it was considered advisable to give a hypodermoclysis of 300 c.c. of 5 per cent glucose solution and postpone operation until the next day.

At operation under open ether anesthesia a middle right rectus incision 4 in. long was made, and an ileocoecal type of intussusception found, with the intussusceptum extending practically to the rectosigmoid junction. Work-

*Read before Section of Surgery, New York Academy of Medicine, April 6, 1928.

ing within the abdomen, the distal end of the intussusceptum was gradually and very easily worked up through the colon by a milking type of manipulation; this was very easily continued until only the last 3 or 4 in. of the intussusception remained to be reduced. At this point difficulty was encountered, so the remaining tumor mass was delivered through the wound. By a combination of milking applied to the intussusceptum and very gentle traction applied to the invaginating terminal ileum the reduction was completed without undue difficulty. At this point the child's pulse had become very rapid so without attempting to suture the terminal ileum to the cecum to prevent a possible recurrence, the wound was closed.

In spite of the month's duration of the condition the involved intestines showed very little reaction. There was considerable edema of the cecum and terminal ileum, but only very slight redness.

The postoperative course was remarkably smooth after the first day. On the first day the temperature was between 104°F. and 105°F. P.R. On the second day it dropped to between 98° and 99°, and remained there throughout the remainder of convalescence. There was no vomiting except immediately after the operation.

The stools contained blood and mucus on the second postoperative day, and mucus but no more blood from the third to the ninth day. After this the stools were normal. There was no postoperative distention.

He was discharged on the fifteenth postoperative day with his wound healed by primary union.

CASE REPORTS BY DR. J. J. VALENTINE*

NEW YORK

BILATERAL RENAL CALCULI

MRS. S., aged fifty-six, admitted to Polyclinic Hospital on Dec. 27, 1926. The interesting points in her history are that she had gastrointestinal symptoms for ten years, and especially for the past four years. She lost 18 lbs. weight during the last four years. Urinary disturbances for twenty years. Voids urine three times at night; during the day every three hours. No dysuria. No history of renal colic.

Chief Complaint. Dull ache right lumbar region for past two months. Marked constipation; fever at times. Recently pain radiated downward and anteriorly along course of ureter.

Examination. There was tenderness on deep palpation over right kidney anteriorly and posteriorly; kidney palpable.

Cystoscopy. Bladder negative except for slight congestion of trigone. Both ureteral orifices normal. Both ureters were catheterized with #7 F. roentgen-ray catheters, meeting no obstruction. Specimens collected and their examination resulted as follows:

	Amount	Appear.	Albumen	Pus	Blood	P.S.P.
Right	20 c.c.	Hazy	Heavy trace	Very numerous	Moderate number of R.B.C.	Trace in 20 min.
Left	10 c.c.	Clear	None	Occasional cell	None	10 per cent in 6 min.

Roentgenogram and pyelogram are herewith submitted. It is interesting to note that no shadows could be made out in the patient's left kidney in any of the pictures taken. Not until her left renal colic, four weeks after right nephrectomy, was it possible to identify the small shadows and then with difficulty.

Operation. Right nephrectomy performed

*Read before Genito-Urinary Section, New York Academy of Medicine, May 16, 1928.

December 31, 1926. No difficulty encountered at operation.

Postoperative History. Patient had a slow convalescence because of general run down condition; she developed a cold, tonsilitis, and some sinus infection, which gradually cleared up. The patient was about ready to go home, when on January 24, 1927, she complained of pain and distress in her left kidney region, together with abdominal distention by gas, general malaise, and she vomited. Her intake of fluids for the preceeding six hours before the onset of these symptoms had been about 1150 c.c., and her output of urine was recorded as only 2 oz. Her left kidney was now palpable, and definite resistance was met on pressure. She became progressively worse and went into complete anuria. Repeated attempts to recover urine from her bladder failed, and there was no urine recovered for a period of nine hours.

An emergency roentgenogram was taken at 8 P.M. on the evening that she became so ill and at cystoscopy a catheter was inserted into her left ureter and 2 c.c. of bloody urine collected. The tip of the catheter met with an obstruction at about 20 cm. and after repeated irrigations through the catheter we failed to obtain a normal drip. After much coaxing, the catheter tip seemed to slip into the pelvis of her kidney, and 16 oz. of urine was obtained in a steady drip. Kidney was then irrigated and catheter left in situ. The catheter dripped well and during the night the patient voided urine. On the following day the catheter was removed. She voided scanty amounts of urine a few times and went into anuria again that afternoon.

Cystoscopy was again performed and roentgenograms were taken. Her ureter was again catheterized and 10 oz. of urine obtained. Catheter left in for drainage. It drained well and patient voided urine. The catheter was left in place for twenty-four hours and then removed. The foot of the bed was markedly elevated in the hope that the calculi might lodge in the kidney pelvis.

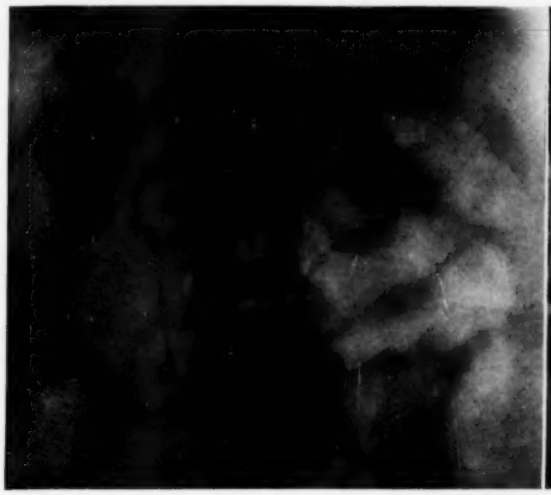

Fig. 1. Prior to operation, showing calculus in right kidney.

Fig. 2. Showing small shadow at tip of catheter and another above it. Left kidney. Complete anuria.

The patient continued to void scantily for several hours, but at 2 A.M. on January 28th, she had a chill and her rectal temperature rose to 107°F.

One more attempt was made to dilate her ureter with the hope of enabling her to pass the smaller of the two stones, but it was found at this cystoscopy that the small stone had passed the ureteropelvic junction and was now firmly wedged in the ureter (Fig. 7); the larger stone appeared free in the kidney pelvis. The ureter was evidently completely blocked as no urine was obtained at this seance. The catheter was left in the ureter to the point of obstruction, and the patient was taken to the operating room at 3 A.M.

Pyelotomy. Left lumbar, oblique and curved incision was made exposing a large, congested and distended kidney full of urine. The pelvis was also found markedly distended. A stone was felt to be free in the pelvis. Another smaller stone was felt just below the ureteropelvic junction where the ureter was very narrow. The pelvis was opened by a small verti-

Fig. 1. Showing catheter coiled up in large pelvis in contact with calculi.

Fig. 2. Pyelogram. Total content of pelvis 70 c.c.

cal incision and urine spurted from the kidney several inches above the field of operation. The force of the spurt of the urine carried with it the stone that was free in the pelvis, and it was recovered from the wound. The smaller stone was stripped upward from the ureter into the pelvis and recovered. The pelvis was not sutured. The kidney was dropped in place, soft rubber tube to pelvis for drainage and two large cigarette drains laid alongside of it. Muscles approximated with chromic and skin with silkworm gut.

Postoperative History. Recovery was slow but uncomplicated.

Notes. This patient has been seen about every two or three months since the last operation, and repeated roentgenograms show no evidence of stone in her kidney. Function is good, and her urine still shows a light growth of colon bacillus on culture. She was last seen in January, 1928, and her general health is very satisfactory.

RENAL CALCULI IN AN INFECTED HYDRONEPHROTIC SEGMENT OF A HORSESHOE KIDNEY*

R. D., Male, aged thirty-eight, first seen in August, 1922.

Chief Complaints. Bilateral pain in lumbar region especially on left side, burning urination, malodorous urine and a constant feeling of soreness in deep urethra.

Past History. Venereal negative. As a child had attacks of frequency and burning urinations. Severe attack fourteen years ago lasting one week.

Present History. Six months ago was in bed over week with frequent urinations, severe pain in left kidney region and hematuria. Three months ago, similar but milder attack. One month ago, blood clots in urine. No loss of weight.

Physical Examination. Well built, strong but pale individual, weighing 160 lbs. Heart and lungs negative. Kidneys were not palpable but pain was elicited on deep pressure over left kidney anteriorly. His external genitals as well as his prostate and seminal vesicles were normal.

Voided urine was cloudy from pus and was malodorous. Urine analysis showed specific gravity 1020, urea normal, phosphates increased, albumen heavy trace. Microscopy showed crystals of triple phosphates in moderate numbers, abundant red blood corpuscles,

pus corpuscles in moderate numbers, a few hyaline casts, Gram negative bacilli, and no acid-fast bacilli.

Cystoscopy. Bladder normal except for trigonitis. Right ureteral orifice normal; left large, puffed and showed encircling erosion of mucosa. Both were catheterized and specimens collected for examinations.

	Amount	Appear.	S. Grav.	Albumen	Urea	Pus	Blood	Bacteria	Crystals	Indigo Carmine
Right	10 c.c. normal drip	Clear	1015	No appr. amount	1.5 per cent	Scanty	Scanty	None	None	7¼ min. good concentration
Left	50 c.c. steady flow	Cloudy	1016	Distinct trace	1.5 per cent	Mod. nos.	Mod. nos.	Many gram-neg. bacilli	Trip. phos. and small concretions	12 min. pale green, watery

Phenolsulphonphthalein (1 c.c. intramuscularly) 1st hour—45 per cent. 2nd hour—20 per cent. Total—65 per cent.

Phenolsulphonphthalein (1 c.c. intravenously):

	Appearance	Am't Collected	Percentage
Right	5 minutes	10 c.c.	15 per cent in 10 minutes
Left	20 minutes	30 c.c.	Faint trace only

Blood Chemistry.

Urea-nitrogen..... 22.4 mg. per 100. c.
Non-protein nit..... 36 mg. per 100. c.
Creatinine..... 3.2 mg. per 100. c.

Roentgenograms and pyelographic studies are herewith submitted. It is of interest to know that 70 c.c. of sodium iodide solution, 20 per cent, was used to fill completely the left kidney and pelvis (Figs. 1, 2).

Preoperative Diagnosis. Calculi in infected hydronephrosis of left kidney.

Operation. September 9, 1922. Gas-ether anesthesia. Left lumbar incision, down to and exposing fatty capsule of kidney, which, when broken through, exposed kidney easily. Many adhesions were broken up, especially at upper pole. First view of kidney showed it to be lobulated; on palpation kidney felt like a sausage. Many abnormal blood vessels encountered. Inspection showed a very large, thin sac, which was the pelvis, situated on the anterior portion of the kidney. In attempting to free the lower pole, it was found that this kidney was fused with its mate on the opposite side. The isthmus was about 1¾ inches in breadth and about ½-inch in thickness. Incision was

Fig. 3. Roentgenogram of left segment of horseshoe kidney removed by hemi-nephrectomy. Shows calculi, a very large pelvis and isthmus.

extended downward and forward, and a heminephrectomy performed. Isthmus was clamped and cut margin sutured with a continuous catgut, running suture. No hemorrhage from the remaining kidney. Wound closed in the usual fashion, interrupted chromic to muscles; silkworm gut to skin. Large cigarette drain in lower angle of wound.

Specimen. The specimen, which represents the left half of the horseshoe kidney, is herewith presented (Fig. 3.)

This patient was seen one month, four months and six months following his operation and again this evening, which is about six years from the time of his operation, and apparently he is enjoying good health.

MALIGNANT ADENOMA OF THE THYROID GLAND*

Locke L. Mackenzie, M.D.

NEW YORK

During the past fifty years tumors of the thyroid gland have given rise to a great deal of discussion, and in no class of tumors has the discussion been pursued with so many conflicting conclusions as in the so-called "benign metastasizing adenoma," perhaps more aptly, the malignant adenoma. It is because of the paucity of cases reported from American clinics as well as the somewhat unique clinical features of this particular case that it was considered sufficiently interesting to be worthy of record.

No attempt will be made to summarize the literature on this subject, but it would be difficult to understand some of the conclusions drawn without mentioning a few of the outstanding points in the history of the problem. The great majority of case reports as well as most of the theories which have been formulated to explain the metastasis of thyroid adenomas come from the Continent, and it is to the German and French investigators that we owe most of our knowledge of this subject.

Apparently it was Müller[1] who in 1871 first emphasized the benign histological character of certain nodules of metastatic thyroid tissue. Five years later Cohnheim[2] reported his now famous case. This case has always attracted great attention as there were numerous metastases throughout the skeleton with what was at that time considered to be an entirely benign thyroid gland. In any event, following it the literature began to contain many a report dealing with this question. In 1883 Wölfler[3] made the statement that when metastases grow and destroy bone the primary tumor should not be considered benign even if its malignancy cannot be detected histologically. When the ectopic anlagen theory came into prominence it was argued that these thyroid metastases were due to displaced islands of embryonic, fetal, glandular tissue, the "wucherende struma" of Langhans. This theory might indeed satisfy those cases in which the secondary growth occurred near the site of the thyroid (in the neck, about the sternum, clavicle, etc.) but it could scarcely explain those in which metastatic nodules were noted far from the original organ.

Von Eiselsberg[4] pointed out that about one-half of the secondary growths were found to be single at autopsy, so that surgical intervention was indicated if it were possible to reach the site of the metastasis. Contemporary surgeons, however, attacked this stand on the basis of the general knowledge of the nature of metastases which are usually multiple. The rationale of treatment was, in the closing years of the last century, largely a matter of personal opinion, with poor statistics to help.

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In 1910 Walther[5] used radium therapy, a type of treatment then in its infancy; his results were, as might be expected, poor. As soon as the roentgen ray came into prominence it was used with, however, much better results on the primary than on the secondary tumors. With the perfection of technique in this field results were more encouraging (Soiland,[6] Ginsburg.[7]) In fact, in the latter's excellent paper, the author stresses the radiosensitivity of metastatic thyroid growths, quoting 2 cases to support his contentions. This paper contains a full review of the literature.

Until the painstaking work of Graham[8] which appeared nearly four years ago, there was no very clear-cut idea of the pathology of that type of thyroid neoplasm which, acting as a cancer in its systemic dissemination yet appears so benign microscopically. Graham states at the outset that any thyroid is malignant if it gives rise to metastases, regardless of its appearance. In this view Bell[9] joins him. In the pathology of the type of tumor which gives rise to metastases Graham deprecates the importance of the histopathology of the cells themselves. Rather he stresses recurrence, metastasis, invasion of the capsule, and, in particular, invasion of the thyroid veins as the only real criteria of malignancy. This last feature Graham demonstrated in all the cases from the rich surgical material of Crile's Clinic in Cleveland. Subsequent observation showed such tumors to be malignant adenomas, as they either recurred or metastasized. In retrospect, it might be well to mention that both in Cohnheim's original case, and in others of the older reports (Middeldorpf[10]) venous invasion was noted in the thyroid, although the neoplasm was considered benign.

It is therefore most difficult to say whether many of the previous cases were benign from Graham's point of view, due to the lack of specific observation of this one point of venous invasion. Oderfeld and Steinhaus,[11] Coats,[12] Kanoky[13] Flatau and Koelichen,[14] and Halbron,[15] as well as many others, report instances of thyroid glands which have given rise to metastases, while histological examination of the primary tissue revealed no evidence of malignancy. Simpson,[16] however, has gathered 77 cases from the literature and concludes that "no single case in the literature offers complete and convincing evidence of the innocent character of the tissue from the thyroid gland or its metastases." For a more complete review of the subject, as well as an admirable discussion, the reader is referred to the papers of Patel,[17] Wilson[18] and Ginsburg.[7]

The case to be reported is of interest in that it is the first case, with one exception to be quoted later, of which the author has been able to find record in which thyroidectomy was done before operation on the secondary tumor. In this instance the true origin of the metastasis was suspected, and histological section of the thyroid was carefully examined for evidences of malignancy; as none were found, it was concluded that the secondary tumor was independent of the thyroid, exploration was performed, and histopathological study showed a typical thyroid adenoma.

CASE REPORT

M. S., an American widowed housewife, aged fifty, white, entered the New York Post-Graduate Hospital November 28, 1927, complaining of the following symptoms: Difficulty in walking, with swelling of the ankles for ten to fifteen years; frequency in urination for 2 years; inability to walk for one month.

Her past history was negative except for the following points: she had had frequent headaches one year ago, relieved by glasses; she had had a goiter for many years, but had noted no recent increase in size; she had had dyspnea on exertion for many years, but she attributed this to obesity; occasional diarrhea was complained of, the last attack two weeks prior to admission; she had had regular nycturia 1 to 2 times a night for five years, and was told three years ago that she had pus in her urine. Her menopause was not yet established.

Her present illness dated back ten to fifteen years when she began to have difficulty in walking. This difficulty gradually increased.

For six months before her admission she noted numbness in the legs and a feeling of deadness in the soles of the feet. In fact, it was necessary for her to look at her feet in order for her to know where they were. She became unsteady, and for the previous month had been unable to walk at all. She was now having nycturia 3 to 4 times each night, with inability to retain her water at times. For the past six months she had had pain in the left lumbar region radiating to the mid-line under the left breast.

Physical examination on November 28, 1927 disclosed a very obese, plethoric, slightly cyanotic and orthopneic individual. Marked pulsation of the carotid arteries was present. The thyroid was enlarged, measuring about 12 cm. across. It was fairly hard and smooth except for a cystic feel of the right lobe, which was perhaps a little larger than the left. A tracheal tug and a faint bruit were present. The lungs were negative. The heart was enlarged in all diameters, with the point of maximal impulse in the 5th space 14 cm. to the left of the mid-sternal line. Apical and conus systolic murmurs were heard; rate 104; rhythm regular. Blood pressure 130/60. The peripheral arteries were not thickened. The liver edge was felt just below the costal margin. Slight edema of the ankles, many varicosities, and scars of old varicose ulcers were present.

On the same date neurological examination disclosed the fact that the patient was unable to turn over in bed while lying on her back with legs extended; nor could she rise to a sitting position without help. Slight intention tremor of the upper extremities and some dysmetria was present. Adiodokokinesis was noted, more marked on the left. The deep reflexes of the upper extremities were diminished and equal; those of the lower extremities were increased. There was bilateral ankle clonus, but no patellar clonus. A bilateral Babinski was noted and confirmed. The abdominal reflexes were absent. There was no atrophy of the musculature, but there was a flaccid paresis of both legs, more pronounced on the left. The right leg, but not the left, could be flexed a little at the knee, and the right foot could be moved off the bed. Abduction and adduction was not possible with either leg. Dorsiflexion and dorsi-extension of the right foot was possible but weak, while neither movement was possible with the left. Electrical reactions showed responses in both legs to the faradic current with 55 milliampères; galvanic stimulation showed no reaction of degeneration and a normal response.

The cranial nerves were negative. The eye grounds showed moderate arteriosclerotic changes.

Sensory examination showed a level corresponding to the 6th and 7th dorsal segments, with greater loss of pain on the right side, and a greater diminution to tactile sensation on the left. Muscle tendon sense was lost in the toes on both sides, while vibratory sense was absent as high as the iliac crests on both sides.

Examination of the urine was negative. Blood examination showed: hemoglobin 90 per cent (Sahli); red cells 4,700,000; white cells 7,500 with 72 per cent polymorphonuclear leucocytes, and a normal differential count. The blood chemistry was normal, and the icterus index was 5.5. The Wassermann reaction of the blood and spinal fluid was negative. The spinal fluid was clear, contained a trace of globulin by Noguchi's butyric acid method, and 2 cells, both lymphocytes. Manometric studies of the spinal fluid suggested a partial block. The colloidal gold curve was 01111000-00-0. Gastric analysis showed the presence of free HCl. The basal metabolic rate four days after admission was plus 49 per cent.

The diagnosis of colloid goiter was made, and the possibility of a metastatic thyroid tumor to the spine was considered. As the patient's general condition was poor it was not thought that she would be able to undergo a laminectomy at this time, and a surgical consultation as to the advisability of thyroidectomy was sought. The surgical consultant advised thyroidectomy, emphasizing that this clinical type of goiter rarely metastasized, and an independent cord lesion was assumed.

As a preliminary to operation, the patient was placed on phenylethylbarbituric acid (grains 3 a day) and quinine hydrobromide (grains 15 a day). Iodine was considered to be contraindicated as the high basal metabolic rate indicated the possibility of a toxic adenoma being present in the goiter. Seventeen days later the basal metabolism was reduced to 32 per cent above normal, and thyroidectomy under ethylene anesthesia was performed by Dr. Charles Gordon Heyd. At operation it was noted that the right lobe of the thyroid was diffusely enlarged. Operation consisted in complete resection of this lobe which was well encapsulated. Recovery was good and exceptionally rapid.

Pathological examination by Dr. Ward H. Cook follows:

Tissue specimen No. 33704.

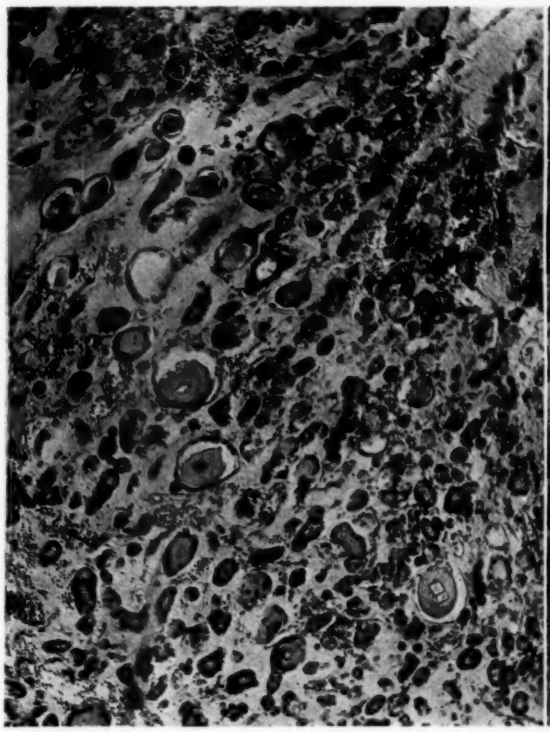

Fig. 1. Adenomatous goiter. (Struma nodosa microfollicularis.)

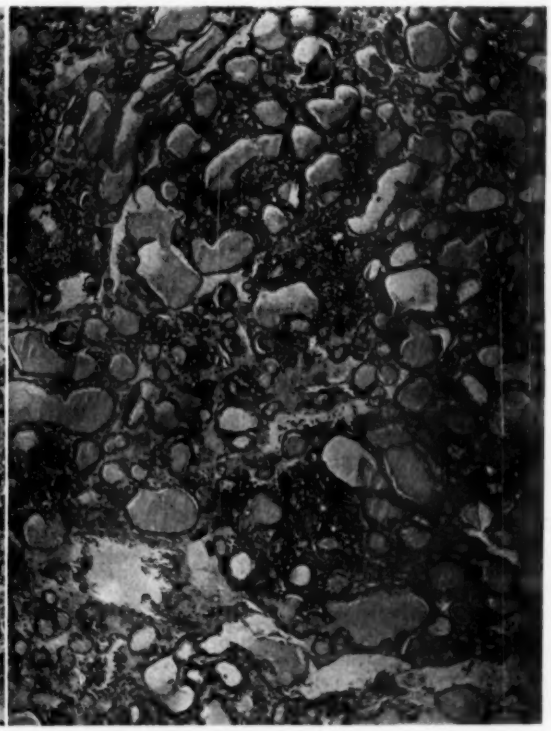

Fig. 2. Growth of vertebra. Metastatic adenoma of thyroid. The metastatic adenoma is more cellular than the primary growth. There are no mitotic figures.

Gross. Specimen is a cystic thyroid, 10.5 × 6.5 × 3 cm. On section the surface is hemorrhagic and edematous with fibrous encapsulation. Toward one pole of the mass are two small tumors, the larger measuring 2.5 × 3 × 1.5 cm. There is a small area of calcific deposits in the wall of the cystic mass.

Microscopic. Section from the wall of the cystic mass shows a thin but definite fibrous capsule with a small amount of thyroid tissue adherent to the outer side. Attached to the inner surface of the capsule is a highly edematous often hemorrhagic stroma supporting numerous small vesicles lined by low epithelial cells and filled with colloid. There are also indefinite groups of solid cell cords without lumen. Associated with the hemorrhage are masses of brown granular pigment contained within large mononuclear cells. Sections from the smaller solid tumors show them to be composed of vesicles resembling those of the thyroid gland. These vary greatly in size, some being small and without lumen; others lined by low epithelial cells are filled with more or less vacuolated, sometimes granular colloid. There is no definite lobular arrangement. The stroma is scanty and edematous. Hemorrhagic areas are seen (Fig. 1).

Diagnosis. Multiple adenomata of thyroid with retrograde changes.

As there was no evidence of malignancy exploration of the spine was now determined upon, the more so because the neurological symptoms were rapidly progressing. By this time, three weeks after admission, all power of motion was lost in both legs. The deep reflexes in the left lower extremity were greater than in the right, and there was transient left suprapatellar and ankle clonus. There was bilateral spasticity of the legs, more on the left. Basal metabolism taken two weeks after thyroidectomy showed a rate of 16 per cent above normal, and the patient's general clinical condition was much improved.

On January 4, 1928, laminectomy was performed under local anesthesia by Dr. Byron Stookey. At operation the following findings were noted:

Bilateral laminectomy was done with the 5th thoracic vertebra at its center. The arches of the 3rd, 4th, 5th, 6th, and 7th were removed.

On coming down to the dura on the left side opposite the 7th thoracic segment and beneath the 5th thoracic vertebra a round vascular protrusion, blood-red in color, was encountered. This had eroded the bone so that the vertebral arch on this side was thinner than on the opposite side. The pressure exerted by the tumor must have been considerable, since marked protrusion of the tumor occurred as soon as the bone was removed. The tumor extended laterally somewhat, and was found invading the 4th, 5th and perhaps the 6th thoracic vertebrae. Hemostasis was fairly well established by packing with hot gauze, and a fairly thorough removal of the tumor was accomplished. The area still remaining was carefully cauterized with Zenker's solution. The dura was smooth and glistening; upon being opened, no extension to the cord was noted. The cord itself appeared whitish and seemed somewhat narrower than usual. The immediate diagnosis was primary sarcoma of the vertebra.

Pathological examination by Dr. Nicholas M. Alter follows:

Tissue specimen No. 33818.

Gross. Specimen consists of a number of soft and bony pieces weighing together about 10 gms. The soft pieces range from 5 to 20 mm. in diameter. They are firm in consistency, rather translucent, with some hemorrhagic foci. They do not suggest any normal tissue structures. The bony pieces are partly covered with some smooth cartilage, and consist of some spongy bone which also contains some of the gray growth-like tissue.

Microscopic. Sections show a glandular growth of small acini. These are lined by one layer of low cuboidal cells. Most of them contain pink-stained colloidal secretion. The lumina of some acini are quite narrow. The stroma is considerable in amount in places and contains free epithelial cells. There are, however, no mitotic figures. The cells are all well differentiated. Some of the acini contain hemorrhagic secretion. Some hemorrhage is also seen in the stroma (Fig. 2).

Diagnosis. Metastatic adenoma of thyroid in vertebra.

A transfusion of 500 c.c. of whole blood was immediately given postoperatively on account of rather profuse hemorrhage encountered during the procedure, and convalescence was uneventful and rapid. Two weeks later the patient was discharged to go to the Memorial Hospital for radium therapy. At the time of her discharge there was some slight return of motion in the right leg. At the Memorial Hospital she was given 12,000 millicurie hours of radium emanation at a distance of 6 cm. over the 3rd and 4th thoracic vertebrae in divided doses as follows· January 22, 1928, 6,000 millicurie hours; January 26, 1928, 4,000 millicurie hours; January 28, 1928, 2,000 millicurie hours.

She then left the hospital and returned to her home, still with very limited motion in her lower extremities. Four months later (May 9, 1928) the patient was much improved having a great deal of motion in both legs, and able to get about the house on crutches. At this time she could even take a few steps without crutches.

On a later visit with the patient, November 1, 1928, almost a year after her admission to the Post-Graduate Hospital she was found to be in excellent health. She had gained 20 to 30 lb. a circumstance possibly due to her thyroidectomy. She complained of no subjective symptoms, and said that she felt better than she had for years.

Physical examination disclosed many points of interest. The thyroidectomy and laminectomy scars were perfectly healed, were not tender, and were not adherent to the skin. Motion of the spine was present normally in all directions. Her gait was normal. She could walk up and down stairs without help. Muscle strength was good and equal in the legs, feet and toes.

There was no dysmetria or ataxia, but there was a slightly positive Romberg sign. The deep reflexes were normal and equal in the upper extremities, while the suprapatellar, patellar and Achilles reflexes were present on both sides, slightly but definitely more active on the left. There was no clonus, and bilateral plantar flexion was present.

The sensory examination disclosed that superficial touch, pain, and muscle-tendon senses were normal and equal in both lower extremities. There was, however, a slight persistence of the old sensory level on the trunk, although it was much less definite than before operation.

The patient now goes about everywhere, enjoying a freedom of motion and a lack of restrictions which she has not experienced for some years.

It would seem that this case illustrates well several points frequently encountered

in metastasizing adenomas of the thyroid. From the standpoint of sex incidence it should be emphasized that the patient was a woman. At the Mayo Clinic 69 per cent of the cases were in women; while Müller and Speese[19] report 60 per cent. Patel[17] stressed the fact that this type of goiter does not usually enlarge while causing metastases, an occurrence one so often sees in the frankly carcinomatous transformations. Throughout the literature one often finds warnings not to overlook the possibility of a malignancy of the thyroid, when tumors of thyroid and bone are encountered in the same patient. For reasons enumerated above, a preliminary thyroidectomy was done in this case, but even with all the resources of careful microscopical study, no evidence of malignancy could be demonstrated. Wilson[18] has stated that the type of tumor which ceases to proliferate and gradually degenerates tends to be "benign" in the sense that it does not invade surrounding structures, and does not metastasize. Yet this thyroid gland was undergoing retrograde changes, and did metastasize.

In one other case quoted by Patel[17] there was reported an examination of the thyroid gland before the secondary tumor was excised. Subsequently, however, this thyroid became obviously carcinomatous.

The clinical results in this case seem to justify the radical conception of attempting to excise surgically a malignant metastasis. What the eventual outcome of the patient will be is, of course, highly problematical. In a comparatively short period, however, she has recovered so far that she is able to enjoy a degree of motion and action impossible for six to eight previous months. It may be argued that radium alone might have produced as good an outcome. In the innominate bone, in the sacrum, and in the skull excellent results have been reported with the sole use of the roentgen-ray but in these situations the tumor was much more superficial than in the present case.

Summarizing then, a case is reported of a woman with a colloid goiter containing two small adenomas, and presenting signs and symptoms of compression of the spinal cord. Thyroidectomy was done. There was neither clinical nor pathological evidence of malignancy judged by any criteria which have as yet been noted. Laminectomy was later performed. In this secondary tumor again no evidence of malignancy could be established under the microscope. Postoperative radium therapy was given, and a short time later the patient was much improved. A few of the more important references to the subject have been included, and a short discussion of the present case in relation to other more or less similar ones is appended.

CONCLUSIONS

1. It is not always possible to recognize the malignancy of an adenoma of the thyroid by either clinical or pathological study.
2. Surgical intervention to excise a metastatic thyroid tumor is sometimes justifiable.

I wish to express my appreciation to Dr. Howard Shattuck, upon whose service this patient was first admitted, and to Drs. Charles Gordon Heyd and Byron Stookey, who later operated upon the patient, for permission to report this case.

REFERENCES

1. Müller, W. *Jenaische Ztschr. f. Med. u. Naturw.*, 6: 456, 1870.
2. Cohnheim, J. Einfacher Gallertkropf mit Metastasen. *Arch. f. path. Anat., etc.*, 68: 547–554, 1876.
3. Wölfler, A. Ueber die Entwickelung und den Bau des Kropfes. Berl., A. Hirschwald, 1883.
4. Von Eiselsberg, A. Ueber Knochen-Metastasen des Schilddrüsenkrebses. *Verhandl. d. deutsch. Gesellsch. f. Chir.*, 22: 255–268, 1893.
5. Walther, M. Tumeur de la dure mere d'origine thyroïdien. Bull. et mém. *Soc. de chir.*, 36: 320–328, 1910.
6. Soiland, A. Recurrent carcinoma of thyroid with involvement of trachea and general metastasis. *Arch. Clin. Cancer Research.* 2: 51–53, 1926.
7. Ginsburg, S. Bone metastasis in thyroid tumors: early diagnosis and radiotherapy. *Am. J. Roentgenol.*, 18: 203–223, 1927.
8. Graham, A. Malignant epithelial tumors of the thyroid, with special reference to invasion of

blood vessels. *Surg., Gynec. & Obst.*, 29: 781, 1924.
9. Bell, F. G. Structural variations in thyroid metastases in bone, with reference to benign metastatic goitre. *Brit. J. Surg.*, 12: 331–341, 1924.
10. Middeldorpf, K. Zur Kenntniss der Knochenmetastasen die Schilddrüsentumoren. *Arch. f. klin. Chir.*, 48: 502–508, 1894.
11. Oderfeld, H. and Steinhaus, J. Ueber Metastasen von normalem Schilddrüsengewebe. *Centralbl. f. allg. Path. u. path. Anat.*, 14: 84, 1903.
12. Coats, J. A case of simple diffuse goitre with secondary tumors of the same structure in the bones of the skull. *Tr. Path. Soc., Lond.*, 38: 399–405, 1887.
13. Kanoky, J. Thyroid tumors of the bones, with special reference to non-malignant pulsating tumors of the skull. *Surg., Gynec., & Obst.*, 22: 679–687, 1916.
14. Flatau, E. and Koelichen, J. Cancer of the occipital and temporal bone and the cerebellum in a girl 17 years old, as a metastasis of a colloid adenoma of the thyroid gland. *Medycyna, Warszawa*, 34: 104, 122, 139, 159, 179, 203, 1906.
15. Halbron, P. Cancer thyroïdien développé au niveau du sternum et simulant un anévrisme de l'aorte. *Bull. et mém. Soc. anat. de Par.*, 79: 373–375, 1904.
16. Simpson, W. M. Three cases of thyroid metastasis to bones; with a discussion as to the existence of the so-called "benign metastasizing goitre." *Surg., Gynec.* 42: 489–507, 1926.
17. Patel, M. Tumeurs bénignes du corps thyroïde donnant des métastases. *Rev. de chir.*, 29: 398–428, 1904.
18. Wilson, L. Malignant tumors of the thyroid. *Ann. Surg.*, 74: 129–184, 1921.
19. Müller, G., and Speese, J. Malignant disease of the thyroid gland. *Univ. Penn. Med. Bull.*, 19: 74–88, 1906.

CASE REPORTS BY DR. HERBERT WILLY MEYER

NEW YORK

EPITHELIOMA OF RIGHT SUPERIOR MAXILLA*

A MAN of fifty-two, born in Porto Rico, was admitted to Dr. George H. Semken's service at The New York Skin and Cancer Hospital on August 25, 1927.

He had had a sore on the alveolar border of the right upper jaw which had caused some pain for the two months previous to admission. The teeth in this region had dropped out by themselves.

Examination of the mouth presented the whole story of the development of an epithelioma. He had various areas of leucokeratosis, precursors of cancer, and at the site of the ulceration a papillomatous growth which had turned into an epithelioma. The Wassermann reaction was negative, and he gave no history of specific disease. The characteristic appearance of the lesion and its rapid onset and growth confirmed the diagnosis of epithelioma. Resection of the right superior maxilla was indicated.

My purpose in presenting this patient is twofold. First to show the cosmetic result of the type of incision used, and secondly to draw to your attention the method proposed by Dr. Semken, of temporarily angulating the external carotid artery during the operation so as to save blood, and also conserve full blood supply to the flap for healing purposes.

The operation was performed on August 30, under 5 oz. of ether-olive oil colonic anesthesia, the ideal anesthesia in our experience for this type of case. The incision for placing the ligature around the external carotid artery was made about 1 in. long at the level of the hyoid bone along the anterior border of the right sternomastoid muscle. The sheath of the sternomastoid muscle is nicked and the incision deepened until the internal jugular vein is seen. By tearing through the thin fascia just *below* the junction of the common facial vein with the internal jugular vein one comes down onto the bulge of the common carotid artery just before it divides into internal and external branches. The first branch of the external carotid artery is seen, the superior thyroid artery and the external carotid artery are completely freed just above this point. The best instrument for this is a grooved director, and then a heavy catgut ligature, single or double, is placed around the artery with a Valentine Mott ligature carrier, an excellent instrument for this purpose. Heavy catgut is advisable so as not to injure the artery or its intima when pulling on the ligature. This

* Presented before Section of Surgery, New York Academy of Medicine, March 2, 1928.

catgut ligature is not tied and a hemostat is placed at its end. The wound is sutured. The sheath of the sternomastoid is closed with interrupted fine chromic and the skin is sutured with fine interrupted black silk. As soon as the incision for the resection of the superior maxilla is begun the second assistant angulates the external carotid artery by gently pulling on the catgut ligature and during the operation the operative field bleeds very much less, as no blood can enter from the external carotid. It is important to place the ligature above the superior thyroid artery as there is a large anastomosis between the two superior thyroids from either side of the neck. At the end of the operation the catgut ligature is cut close to the skin with a clean scissors and this at once restores the normal circulation and the skin flap has its full blood supply for good healing. This little procedure as proposed by Dr. Semken and used on his service is excellent and highly recommendable for various procedures in which formerly the external carotid artery has been permanently ligated.

The incision as used on our service is made from a point just below the inner canthus of the eye downward along the side of the nose, around the ala of the nose to the midline and then downward directly through the entire thickness of the lip. This incision is deepened to the bony structures and the flap is dissected outward by pushing the structures with a raspatory. As much of the mucous membrane is saved as possible, depending on the proximity of the cancer and its encroachment onto the buccal mucous membrane. The pyriform opening is well exposed and with this type of incision the entire outer surface of the superior maxilla is accessible. If necessary an additional incision can be made horizontally outward from the upper point of the incision along the inferior orbital margin. The mucous membrane of the nose is then most carefully separated from the floor and outer bony wall of the nose and then the usual bone sections are made. As much of the floor of the orbit is saved as possible in order to prevent the annoying dropping of the eye. In this case this was possible as the lesion did not extend upward.

After the superior maxilla had been thus removed the raw surfaces were cauterized with the hot cautery as used on Dr. Semken's service in order to destroy any possible cancer cells and also make a thin eschar which will prevent absorption from the raw surface. An iodoform gauze packing was then placed in the defect, held in place with black silk sutures and the flap returned in place and most carefully sutured. The most important suture, the first to be placed and the last to be tied, is the one directly at the vermilion border of the lip. With this patient very little deformity was visible after the resection of the jaw. The pathological examination showed the tumor to be a prickle-cell epithelioma.

After complete healing has taken place a denture can be made to close the opening in the region of the hard palate if the patient is annoyed in swallowing or if difficulty in talking is experienced. Dr. Edward Kennedy, the consulting dentist of the Skin & Cancer Hospital has made most ingenious dentures for these cases composed of upper and lower plates joined at the posterior end with a spring which automatically holds the plates apart. As the mouth is opened the plates come apart and the upper one keeps the opening in the upper jaw closed. When the patient closes the mouth he does so against the spring action. In this way the upper plate is continuously held against the upper jaw and the patients are most comfortable and are well able to talk and eat.

DISCUSSION

Dr. Howard Lilienthal. There is a question whether the full return of circulation is advisable in these cases. A number of years ago a prize essay was written by the late Dr. R. H. M. Dawbarn in which he discussed the treatment of certain inoperable cases of malignant growth of the face and jaw by extirpation of both external carotids with ligation of all the branhes up to the internal maxillary. His theory of starvation of the growth was based on good physiology. It has been shown that malignant growths necrose before the healthy structures when the blood supply is cut off. I believe that if I had to operate on a case like this one I would extirpate the external carotid and then do the operation under a permanent instead of a temporary ischemia.

Dr. Meyer (in closing). I agree with Dr. Lilienthal that ligation of main arteries in inoperable cancers is a wise procedure. It starves the tumor and retards its growth. If a cancer is operable, however, radically removable with proper cancer technique, and the tumor is removed in toto, then ligation of the

artery is of no value. If a reconstruction operation has to be added, it is of the greatest value and benefit to have the full blood supply entering the operative field at the completion of the operation. This important point was demonstrated in the case presented. Ischemia was brought about by the temporary angulation of the external maxillary artery instead of permanent ligation.

SPLENECTOMY OF GUNSHOT WOUND OF SPLEEN

A YOUNG man of twenty-six was admitted to the service of Dr. Carl Eggers, at the Lenox Hill Hospital, during the night of May 8, 1927. He had been shot five times and roentgen-ray examination showed that one of the bullets had penetrated the complementary space of the left pleural cavity and had then entered the abdomen through the diaphragm and passed through the 12th rib posteriorly and was lying just under the skin in the region of the spleen.

There was evidence of injury to some intra-abdominal organ. The kidney could be ruled out and a diagnosis was made of injury to the spleen with hemorrhage or possibly injury to the colon. Immediate exploratory laparotomy was indicated.

It was found at time of the operation that there was a tear of the posterior surface of the spleen which was small and very high up in the vault of the diaphragm and covered by a much distended stomach. Access to the pedicle was difficult. Therefore in order to get better access the left costal arch was turned up according to the technique as advised by Marwedel and used by Dr. Willy Meyer in New York and published by him in 1906. This immediately gave most excellent access and the splenectomy was very simple.

The patient made a somewhat stormy convalescence on account of the infection of the abdominal wound with Staphylococcus albus, probably carried into the abdomen with the bullet. During convalescence the remaining bullets were removed under local anesthesia.

The patient is now in excellent condition except for a weakness in the abdominal wall for which he is wearing an abdominal supporter.

DISCUSSION

DR. WILLY MEYER: I would like to say just a few words in regard to resection of the costal arch. If one has to operate within the dome of the diaphragm it is best that one can see what is going on. It is an advantage to have the exposure made by dividing farther downward the tissues already in front of the operator, making a large skin-muscle-cartilage-flap and turning that then well up and outward. Then the surgeon can clearly see what he is doing.

CASE REPORTS BY DR. J. WILLIAM HINTON*

NEW YORK

EXOPHTHALMIC GOITER (2 CASES)

CASE 1. W. H., male, admitted to Post-Graduate Hospital June 27, 1923.

Chief Complaint. Swelling of neck.

Family History. Mother has had a goiter for forty-five years.

Past History. The usual childhood diseases. Scarlet fever when seven years old. No surgical operations. Venereal disease denied. Bowels regular. No urinary disturbances.

Present Illness. Patient stated he had had an enlargement of his neck for several years but for the past eight or ten months he had lost weight, about 40 to 50 lbs. His eyes were enlarged and he was extremely nervous. Had palpitation of the heart. Had been told he had a goiter but was advised against operation. Chief complaint at this time was pain in his back. Stated that he had had this for the past two years. Had been unable to work due to the pain in his back and the goiter. Roentgenograms had been taken. Had worn a brace and belt without relief. His chief desire was to obtain relief from his back and not from his goiter.

Examination. Patient was a well developed and nourished man, thirty-one years old.

* Read before Section of Surgery New York Academy of Medicine, March 2, 1928.

Eyes revealed a definite exophthalmos. Neck; an enlargement over the thyroid region with a definite thrill over same. Pulse 120 and a definite tremor of fingers. Patella reflexes exaggerated. Examination of back did not reveal any muscle spasm or limitation in bending. No external evidence of disease to the lumbar vertebra.

Diagnosis. Exophthalmic goiter. Roentgenograms of the lumbar and sacral regions of the back were reported negative. Wassermann negative. Patient was advised to have the goiter treated and the back symptoms would probably disappear.

Admitted to Post-Graduate Hospital June 27, 1923. Basal metabolism taken June 28 was plus 27. Wght. 156 lbs. Patient was put on luminol grains 1½, Lugol's solution mm. 7, ovarian substance grains 3, pancreatic substance grains 2, Q. 4 H.

Operation, July 2, 1923. Under gas oxygen ether anesthesia. Low collar incision was made, skin flaps dissected up, muscles separated in midline, clamped and the sternohyoid and sternothyroid muscles were divided. The right lobe, was delivered, capsule dissected off and practically the entire lobe removed, leaving a small amount of tissue at the superior pole. Same procedure carried out on the left side, leaving a small amount of tissue at the superior pole. Muscles sutured with No. 2 plain catgut, skin, with silk. Rubber tissue drain inserted.

Follow-up, July 15. Patient stated that since operation he had no complaints referable to his back. He left his belt when he left the hospital. Wound had a slight serous discharge. Pulse 120.

July 25. Sleeping and eating well.

Aug. 2. Stated that he felt much improved since operation. He had gained 5 lbs. in weight and was anxious to return to work. Advised to wait until August 15.

Aug. 15. Returned to work on August 15, 15 lbs. heavier than before operation. Sleeping well. Pulse 96. Did not tire easily.

Oct. 10, 1924. Basal metabolism minus 7. Patient 40 lbs. heavier than before operation. Stated that he had worked ten to twelve hours a day for the past year. Felt perfectly well.

May 9, 1927. Patient stated that he had not lost any time from work since operation. Blood pressure 120/80. Pulse 76. Weight 180.

Case II. G. S., female, admitted to Post-Graduate Hospital May 10, 1927. *Chief Complaint.* Patient was first seen on May 3, 1927, complaining of swelling of her neck, nervousness and enlargement of eyes.

Past History. She had never had any serious sickness or surgical operation. Had had whooping-cough and measles. Received a fracture of right tibia in December, 1924. Incapacitated for three months, otherwise in good health with the exception of present complaint.

Present Illness. About November, 1925, when patient was nine years old her mother noticed a slight enlargement of her neck. She had a cold at the time and consulted her family physician who advised taking her to a hospital for examination. She went to a clinic in one of the Metropolitan Hospitals in December, 1925. Was told she was suffering from a goiter and advised to remain in bed at home for two weeks, and given medicine to take. When she returned to the clinic she had lost 2 lbs., then weighing about 55. She did not know her best weight. Was then advised to enter the hospital which she did on December 28, 1925. She remained in the hospital for six to seven weeks. Her tonsils and adenoids were removed at the time. The mother was definitely advised against an operation until the child was fifteen years old. She did not seek further medical treatment until May, 1927. During this time the child did not gain in weight, her eyes became more prominent and she was very nervous and irritable. Did not play with other children because she tired very easily. Had frequent colds and lost several weeks from school at a time.

Examination. Eyes markedly enlarged. Definite enlargement over the thyroid region with a marked thrill over same. Measures 26½ cm. No murmurs or arrhythmia. Blood pressure 140/80. Throat negative. Teeth in good condition. Definite tremor of hands. Patella reflexes exaggerated.

Diagnosis. Exophthalmic goiter and operation advised.

Basal metabolism May 12, 1927, plus 49. Weight 61 lbs. Patient was put on Lugol's solution mm. 5, ovarian substance gr. 3, pancreatic substance gr. 2 and luminol gr. 1, Q. 4 H. Basal metabolism on May 20, 1927 was plus 23, weight 59 lbs. During this time the patient was quite ill and she had diarrhea and incontinence. She ran a temperature ranging from 99°F. to 102°F.

Operation, May 21, 1927. Under ethylene

anesthesia, low collar incision was made. Skin flaps were dissected up, muscles separated in midline. Right lobe was easily delivered. Capsule dissected off. A small amount of tissue was left at the superior pole on the right side. Same procedure was carried out on the left side leaving a small amount of tissue at the superior pole. Isthmus removed. Muscles sutured with No. 2 plain catgut, skin, with silk.

June 3. Slight serous discharge. Wound cleansed, dry dressing applied.

June 6. Wound cleansed. Dry dressing applied. Weight 69¼ lbs.

June 9. Wound cleansed. Dry dressing applied. Weight 71¾ lbs.

June 13. Wound cleansed. Dry dressing applied. Weight 73½ lbs.

June 16. Wound cleansed. Dry dressing applied.

June 20. Wound cleansed. Dry dressing applied.

June 24. Wound entirely healed. Patient cured and discharged. Weight 73¼ lbs. Patient is going to the country and will report upon her return.

Oct. 19. Patient attending school. Had no complaints. Slept well and was steadier and less restless. Weight 79¾ lbs. Pulse 90. Blood pressure 110/80. No tremor of fingers. No thrills over neck.

Feb. 23, 1928. Mother stated that patient had not lost any time from school since September, 1927. Up in her studies and perfectly well. Weight 85¼ lbs. Blood pressure 100/70. Pulse 96. Slight tremor of hands. Reflexes not exaggerated. Basal metabolism plus 9.

ADENOMA OF LEFT VALVE OF THYROID

MRS. E. LeF., admitted to Post-Graduate Hospital May 25, 1925.

Chief Complaint. Enlargement of left side of neck.

Past History. Patient married and had two children, the oldest two and the youngest one year old. Never had any serious illness or surgical operations. Always been in excellent health with exception of present complaint.

Present Illness. Patient stated that after birth of her first child, two years ago, she noticed an enlargement of the left side of her neck. This gradually increased in size. She had not been nervous, had any choking sensations or palpitation of heart. She had taken medicine which I assumed was thyroid extract. She was also given some salve which may have been iodex. In December, 1924 basal metabolism was minus 7. Had one roentgen-ray treatment but did not return for more.

Examination, April 15, 1925. Eyes normal. Throat; some tonsil tissue on the right side. Teeth in fair condition. Neck; enlargement more marked on left side of thyroid gland, rather firm but no evidence of thrills. Heart; no enlargement or murmurs detected. Blood pressure 130/80. Pulse 90. No tremor of hands.

Diagnosis. Adenoma of left lobe of thyroid.

Operation, May 26, 1925. Under rectal anesthesia, low collar incision was made. Muscles separated in midline, not divided. Left lobe was enucleated and the adenoma was found to have cystic degeneration. Considerable fluid escaped. All of the left lobe was removed with the exception of a small amount of tissue at the superior pole. About ¾ of the right lobe was removed, leaving most of the tissue at the superior pole on right side. Isthmus of thyroid was removed. Muscles closed with plain catgut, skin, with silk. Rubber tissue drain inserted.

Postoperative. Within eighteen hours after operation patient complained of tingling sensation in hands. Twenty-four hours later she had definite spasms and clonus of hands, with a typical picture of tetany. She complained of pain and tingling sensation in face. Was given calcium lactate gr. 20, Q. 4 H., parathyroid gr. ⅕ Q. 4 H. and thyroid extract gr. 2, t. i. d. Also four doses of calcium chloride gr. 15, intravenously O. D. for four doses. The spasms disappeared after the injections of calcium but returned in a few hours following the first injection. After each injection the patient was free from symptoms for a longer period of time. After the fourth injection patient remained in the hospital forty-eight hours and was entirely free from symptoms.

Follow-up, June 5. Patient still had some tingling sensation in her hands, and occasional tingling sensation in legs. No other symptoms. Otherwise feeling normal. Was advised to continue parathyroid extract, gr. ⅕, t. i. d., calcium lactate, grains 20, t. i. d. To discontinue iodine and return in one week.

June 13. Calcium chloride, grains 15½, intravenously.

July 3. Calcium chloride, grains 15½, intravenously.

July 10. Calcium chloride, grains 15½, intravenously.

July 17. Calcium chloride, grains 15½, intravenously, condition about the same.

July 25. Calcium chloride, grains 15½, intravenously. Still had sensation in legs, although her condition improved.

July 31. Calcium chloride, grains 15½, intravenously. To continue mouth medication as previously prescribed. Felt perfectly normal with the exception of the tingling and numbness in hands and legs.

July 7. Remained about the same. Calcium chloride, grains 15½, intravenously.

July 20. Calcium chloride, grains 15½, intravenously.

July 31. Patient stated she felt better and only had the tingling every few days. Calcium chloride, grains 15½, intravenously. To continue with medication.

Sept. 8. Condition about the same as before stated. Calcium chloride, grains 15½, intravenously.

Sept. 18. Patient had very little discomfort since her last visit. She was given calcium chloride, grains 15½, intravenously.

Oct. 3. Stated that she had not had any discomfort since her last visit and felt normal. She was given calcium chloride, grains 15½, intravenously, and instructed to continue the mouth medication and return at the end of that time.

Feb. 10, 1926. Patient returned stating that she had been free from symptoms since her last visit. Reason of delay, residence far out of town. Will return sooner if she has symptoms.

URETERAL ANASTOMOSIS*

Edward L. Keyes, M.D., F.A.C.S.

NEW YORK

THIS man, when I presented his case last year, had a bilateral kidney tuberculosis of which I did not wish to speak in his presence. I operated on him at Bellevue and removed his left kidney in 1923. His bladder remained as uncomfortable as ever. He had secondary lesions in his right epididymis and a rib. In April, 1927 he was so uncomfortable and sick that I transplanted his ureter into his abdominal wall and performed epididymectomy. May 16, I catheterized him and his urine is now clear. He has no spasm or pain excepting very rarely.

An interesting part of the case is an apparatus which he has invented, simply a rubber band, more or less like a suspender, extending over the cup which he wears. At night he wears a tin cup, one that anybody can make, and it keeps him dry.

* Read before Section of Genito-Urinary Surgery, New York Academy of Medicine, May 16, 1928.

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EDITORIALS

THE DIFFICULTIES AND PITFALLS OF TRANSPLANTATION OF THE URETERS INTO THE LARGE BOWEL

PROBABLY no more important nor bewildering problem has ever engaged the attention of clinical and experimental surgeons than that of transplanting the ureters into the large bowel. In no other place in the human body does a single principle and the technical procedure necessary to make the principle effective, control such a large field of surgery. For, upon this single procedure, all surgery contemplating the elimination of the bladder as a reservoir for urine depends.

As one reads the literature and records of the attempts made to solve this problem, the most surprising thing encountered is that while the statement to the effect that the ureter opens into the bladder "by a constricted orifice after having passed obliquely for nearly an inch between its muscular and mucous coats" has been in Gray's anatomy for more than thirty years, its full significance was not generally appreciated by experimenters. The knowledge that the ureter ran beneath the loose mucosa for nearly an inch before entering the bladder apparently made little impression for the reason that the problem involved had not been isolated and defined. The problem itself was discovered by accident in a set of experiments in which it was necessary to transplant the bile duct into the intestine below its normal site. Two weeks later, it was invariably found that the duct which had been transplanted directly into the intestine was enormously dilated. This was observed in every case. Obviously a fundamental principle was involved. By tracing bile ducts along their courses into the intestines of dogs, it was found that the duct always ran beneath the loose mucous membrane for a distance before entering the lumen of the bowel. Ducts surgically placed in this submucous position were found not dilated two weeks

after transplantation. The problem had been isolated and its solution had been found. The abstract problem was the delivery of fluids from a viscus of low pressure to one of higher pressure. The solution was found in the production of valve action. The immediate problem at hand was the delivery of the fluid of a secreting organ in the ducts of which the pressure must be low and regular, into a second hollow viscus in which the pressure is high and irregular. The solution was the production of a valve from the non-motile mucous membrane of the second viscus.

Considered broadly, it would seem that the valve is the only mechanism by which fluids and gases, at a given temperature, may be transmitted from a chamber of low pressure to one of higher pressure. Working upon this principle, it was possible to present five undilated ureters and undamaged kidneys of dogs operated upon 60 to 167 days prior to the removal of the specimens, to the Surgical Section of the American Medical Association at St. Louis in June, 1910. Dr. Charles H. Mayo, who was Chairman of the Section at that time, soon applied the principle and technique to the human being. Since that time he has operated upon nearly a hundred patients. His results, taken with those of Lower and operators of less experience, have furnished indisputable proof that ureters thus transplanted safely deliver the urine into the large bowel with very little danger of infection of the kidney as a late result. But the fact that even in these most skilled and experienced hands the immediate mortality from infection was considerable while in less skilled hands it was almost prohibitive, caused many urologists to condemn the procedure as unjustifiable. Even in the hands of these most skilled operators, the fact that only one ureter could be transplanted at a time, thus requiring two or three major operations in removing the bladder, made the operation impractical for most conditions other than exstrophy of the bladder.

The development of the bilateral tube technique described in the November, 1928 *Snrgery, Gynecology and Obstetrics* has placed the operation on an entirely different plane and makes it available for any condition in which it is necessary to dispense with the bladder as a urinary reservoir. For it must be conceded that the successful operation upon thirteen consecutive patients by the same operator without operative death or demonstrable injury to the kidneys, aside from a single fistula from one ureter, entirely removes the element of chance as an important factor. Yet it is easy to foresee many difficulties in the way of establishing this operation as a generally adopted procedure.

One of the greatest difficulties in the way is the tendency of most surgeons to modify a new operative procedure so as to harmonize it with their particular principles. Second, it is going to be difficult to convince many surgeons of the importance of the quarantine which in reality is the means of making the operation extra-peritoneal in effect. There is no gainsaying the fact that this is not a simple operation. It is doubtful if there is any abdominal surgery in which a meticulously perfect technique is more important and in which there are so many details to be looked after. A long and arduous experience, both experimental and clinical, forces the conclusion that there is no important detail described in this article which may be safely omitted. I believe that the quarantine will prove to be an absolute essential if one is to have uniformly good success.

The greatest obstacle of all, however, to the universal adoption of this operation, is that it is essentially a highly technical *intestinal* operation. It is primarily not a urological operation. The great majority of the cases are diagnosed by urologists, many of whom have had very little experience in intestinal surgery and who are therefore likely to meet with frequent disaster.

How are these inconsistencies to be

reconciled? A few urologists are also skilled intestinal surgeons. No doubt, still other enterprizing urologists will by cadaver practice, experimental surgery on animals and a large clinical experience, master this particular feature of intestinal surgery but it is more than likely that the majority of urologists will not. What will this latter group do with their cases? Will they cooperate with the general surgeon who is skilled in intestinal surgery or with urologists who have mastered this technique, or will they, basing their opinions on unfortunate personal experiences, condemn the operation as unjustifiable?

R. C. Coffey.

ELECTROSURGERY

THE first of a series of articles on Electrosurgery was inaugerated in the February number of The American Journal of Surgery. We feel the profession has much to learn concerning this new spoke in the surgical wheel. It is perhaps a more or less general feeling that this field of surgery should be looked upon with suspicion. That this is unfair and without foundation goes without saying. Perhaps this unfavorable idea gained ground because, as is true of all new ideas, it has been adopted and pushed to ridiculous limits and wantonly abused by cliques of pseudoscientific charlatans hiding their collosal ignorance behind the degree of Doctor of Medicine. However, due to patience and persistent hard work many sincere workers have seen a legitimate field for electrosurgery. It is our purpose to have these men, whose reputations are beyond discussion, use our pages to carry their messages.

Grant Ward of Baltimore contributed the first article of this series. This month William L. Clark of Philadelphia leads off the issue with an essay of worth. In April, Howard Kelly continues with a unique article.

Feeling it would not be fair to our readers to assume the task of soliciting and editing these articles we looked about for some one of recognized scientific surgical reputation to guide us. Our quest ended in the happy selection of Dr. Grant Ward, whose large experience and excellent judgment particularly fit him for this task.

Dr. Ward is responsible for the articles on electrosurgery that have appeared and will appear during 1929. He has been given a free hand. All articles on this subject are passed and edited by Dr. Ward and therefore have the mark of authority and scientific worth.

BRITISH LETTER

SIR D'Arcy Power, K.B.E., F.R.C.S., recently gave a short but fascinating address on the revival of interest in surgical literature in England during the first half of the sixteenth century he said:

The Wars of the Roses so troubled England during the fifteenth century that surgery became little more than a handicraft and there was no surgical literature. The process of reconstruction occupied the first half of the sixteenth century and began with an attempt to unite the Fellowship of Surgeons with the Company of Barbers. The former body impoverished and small in numbers represented the consulting surgeons of today, men who had served their apprenticeship in war and found their occupation gone when peace came, the latter numerous and rich, were the general practitioners of the day, and had obtained a Charter as a Livery Company of the City of London. They performed their duties well, but were commercially minded and had no wish to ally themselves with impoverished surgeons who were, perhaps, more highly skilled in their science and had certainly seen more of the world: the very wideness of their outlook might make them inconvenient partners for they would be sure to advocate radical changes in a business which was doing very well on the old lines.

In spite of the flagrantly opposed interest of these two sections of the community professing surgery they were united into one Body Corporate in the year 1540, thanks to the good offices of such leaders as Thomas Vicary, Richard Ferris, Sir John Aylef and James Monford. It was after the grant of this Charter to the

Barber Surgeons of London that Surgery in England as a profession began once more to progress after a long period of somnolence. The cry of the Surgical Reformers was in part the basic principle of their craft published in various writings more or less copied from old masters with additions and comments, the best known of the period being those of Vicary, Hall, and Read. Thomas Vicary was the first Master of the United Company, Sergeant Chyrurgeon to Henry VIII and attached to St. Bartholomew's Hospital. The first edition of Vicary's book is a duodecimo published by Henry Bamforde in 1577. It was called the Englishman's Treasure with the true Anatomie of Man's Body" and was issued posthumously, for Vicary died in 1561. There was most likely, however, an earlier edition published about 1548. The work is so alluring in its sincerity that there need be no excuse for quoting it in part. In the first chapter he declares:

Three poyntes very expdient for al men to knowe, that intend to vse or exercise the mysetrie or Art of Chirurgerie. The first is, to knowe what thing Chirurgerie is; The second is how that a Chirurgion should be chosen; And the thirde is with what properties a Surgion should be indued.

Vicary was evidently well aware that the general education of his professional brethren was defective in many ways; hence he continues:

He ought to be learned and that he knowe his principles, not onely in Chirurgerie but also in Phisicke, that he may the better defende his Surgery; And also he ought to be seene in natural Philosophie, and in Grammer, that he speake congruitie in Logike, that teacheth him to proue his proportions with good reason. In Rethorike that teacheth him to speak seemely and eloquently: also in Theorike, that teacheth him to know things naturall, and not naturall, and thinges agaynst Nature. Also he must know the Anatomie, for al Authors write against those Surgions that worke in mans body not knowing the Anatomie, for they be likened to a blind man that cutteth in a vine tree, for he taketh more or lesse than he ought to doo. And here note wel the saying of Galen, the Prince of Philosophers in his Estoris.

That it is as possible for a Surgion (not knowing the Anatomie) to work in man's body without error, as it is for a blind man to carue an image & make it perfyt. The ijd, I said, he must be expert: for Rasus sayth he oughte to knowe and to see other men work and after to haue vse and exercise. The thirde, that he be ingenious or witty: for al things belonging to chirurgerie may not be written nor with letters set foorth. The fourth (I sayde), that he must be wel manered, and that he haue al these good conditions here folowing . . .

These truly are precepts for all times, namely:

That a Chirurgeon must take heed he deceiue no man, with his vayne promises, nor to make of a smal matter a great, because he woulde be accounted the more famous . . . . Likewise, they shal geue no counsayle except they be asked, and then say their aduised by good deliberation, and that they be wel aduised afore they speake, chefly in the presence of wise men. Likewise they must be as priuie and as secrete as any Confessour of al thingis that they shal eyther heare or see in the house of their pacient . . . . And see they heuer prayse them selues for that redoundeth more to their shame and discredite than to their fame and worship: For a cunning and skilful Chirurgion neede neuer vaunt of his dooings, for his works wyll euer get credits ynough. Likewise that they despise no other Chirurgion without a great cause: for it is meete that one Chirurgion should loue another, as Christe loueth vs al. And in thus dooing they shal increase both in vertue & cunning to the honour of god, and wordly fame to whome he bring vs al. Amen.

One can gather from these few written expressions of Vicary's innermost thoughts how ardently he desired to promote the very highest motives in the younger members following the Craft of Surgery, and his anxiety that they should be led along that path which could alone bring about true fellowship in a noble profession. He is rightly esteemed by his successors as one of nature's gentlemen, gifted with the highest motives and kindliest feelings towards his fellow men.

Power refers at some length to John Hall's "Treatise on Anatomy" which was published in 1565, and describes it as an original work, not a compilation but a simple statement of anatomy as Hall knew it. It was written for the use of apprentices and members of the recently formed United Company of Barbers and Surgeons who were obliged to attend lectures by Dr. Cains and Dr. William Cunningham (1563–1569). Written as it was for those unskilled in the Latin tongue it indicates the information given in the lectures of the period and from it we can gather the type of examination which every apprentice had to pass before he obtained his license to practice "in London and seven miles round." A series of possible questions are constructed by the lecturer from the book for an oral examination (*coram publico*) as was then the custom, which are of more than passing interest to the students of medical history:

1. From what are the words Chirurgion and Cancer derived? Give the Greek and Latin equivalents for each.

2. Mention the complexions of the body. How would you know whether a man was of a sanguine or saturnine complexion?

3. How many bones are there in the human body?

4. What are the uses of the liver? Where does it lie in the body?

5. Define an imposthume? How can it be cured?

6. What does a surgeon mean when he speaks of an algebra? How should it be treated when it occurs in the upper arm?

7. Mention in order the structures which would be divided to expose the great ventricle of the brain, beginning from the skin.

8. Who were Galen, Avicenna, Lanfrancus, Guido Cauliacus, Johannes Vigensis, Andreas Vesalius, Thomas Genuisos and Carolus Stephanus. What discoveries or methods of treatment are connected with these names? N.B. Questions 7 and 8 need only be answered by those who wish to obtain the Company's great diploma. The description of the book ends with "A conclusion" written in pleasing Elizabethan style at the end of the second part:

> Lo thus have I ended this second treatise, although grossly and unlearnedly; trusting notwithstanding that it will be gently borne withal. Truly my masters and brethern these are but ears of corns that I gleaned in times past after the bindings of the plentiful sheaves of others, trusting to God that hereafter (though not yet) I shall be able to bind sheaves of mine own and scatter some ears for such as must glean and gather their handfuls of other mens leavings. Neither wish I that we should any longer live than we should show ourselves profitable one to another. In the which as we may learn in holy writ and as the divines continually blow in our ears, we shall be known to be servants of our Lord and Saviour Jesus Christ who taught his disciples to love one another. Saying by this ye shall be known to be my disciples in that ye love one another. The which love God grant us all. Amen.

ULCERS

During the past year much has been written in the medical press and propounded at medical meetings on the surgical treatment of gastric and duodenal ulcers in this country. But so great is the divergence of the views and methods of well-known surgeons that a short résumé of a few individual surgeons' preferences may be of some assistance in establishing a line of action in certain cases.

We cannot hope here to enter into the various theories of the cause of ulcer over which there is still a considerable clash of opinion, save to mention the responsibility of sepsis and bacterial necrosis of the alimentary mucosa, and a peculiar ulcer diathesis (Hurst).

There is still an unfortunate confusion of terms which adds to the difficulties in correlating the writings of various surgeons. For instance the term peptic ulcer is loosely used to indicate an ulcer within touch of the gastric juice which may be therefore gastric, duodenal or jejunal. Again other terms such as "gastroduo-

denal" ulcer and "juxta pyloric ulcer" "prepyloric" and "postpyloric ulcers" have been introduced.

Moynihan lays great stress upon the pyloric vein as a boundary mark between the duodenal and gastric ulcer, and maintains that the basis of treatment depends upon the location of ulcer. Dr. Izod Bennett declares there is practically no difference between a duodenal and a gastric ulcer close to the pylorus and the relation of the pyloric vein to the pylorus is not constant and therefore may be misleading. This need not be considered a difference of vital importance for Moynihan further states in an analysis of over 2000 cases, less than 3 per cent of chronic gastric ulcers occurred at the pylorus or within 1½ inches of it, so that gastric ulcer close to the pylorus is very unusual. Therefore although there may be differences of opinion as to the exact geographical location of the ulcer the resemblance in the symptomatology of these ulcers in the vicinity of the pylorus are such that with regard to surgical treatment they frequently demand the adoption of identical methods.

The question of treatment of duodenal ulcer has been particularly prominent in the medical papers and amongst others Drs. Hurst, McLean, Spriggs and Izod Bennett have expressed their opinions very forcibly that in the majority of uncomplicated cases operation is unnecessary.

Dr. A. F. Hurst in a recent address at the Cardiff meeting of the British Medical Association said:

> Surgery has taught us that duodenal ulcer is a common disease with characteristic symptoms instead of an undiagnosable rarity. It has taught us how frequently gastric symptoms are the reflex results of disease in the gall bladder and appendix. Finally and most important it has shown us how often it fails to cure the disease it has taught us to recognize; and how often it gives rise to new and artificial diseases formerly unknown. It has thus stimulated us so to improve our methods of medical treatment that we may look forward to the day when all unsuccessful gastro-jejunostomies have been undone, and the only gastric operation the surgeon is called upon to perform is gastrectomy for early carcinoma.

This is undoubtedly a very incisive summing-up on the situation by a physician and a challenge to the surgeon either to establish present-day operative procedures on a sounder basis or give way in favour of the physician. The general consensus of opinion at present is that medical treatment including rest, diet, alkalis, and the elimination of any definite foci of epsis should be tried first.

This treatment, too, often fails even after a second and third trial, because to be effective the time required cannot be given. Usually the unfortunate patient cannot afford the time and the necessary expense and even then the rigorous dietary is liable to be broken, for to many it is extremely disagreeable. Then again should the ulcer heal with the treatment there is the possibility of deformity resulting such as stenosis of the pylorus which will require later surgical treatment.

It is therefore evident that one must take into consideration the type of patient and study that patient from every angle (mental outlook, occupation, surroundings, obligations, extent of the individual's purse and so on) and not suggest a medical cure when it is practically unattainable for obvious reasons. This being so we can consider the types of operation most likely to give a cure quickly and with the least possible risk to a person suffering with a chronic pyloric or duodenal ulcer. The surgical measures adopted in this country can be discussed under three headings:

1. *Simple Gastroenterostomy*. This operation gives very good results, the bad results as a rule follow errors of technique. This method has the support of Sherren and Patterson, and is still adopted by many surgeons. There are certain drawbacks, the ulcer may bleed, may perforate, may not be cured.

2. *Gastroenterostomy Combined with Enfolding of the Ulcer.* Walton imbeds the ulcer with a running mattress suture, and if the ulcer is on the posterior wall he takes up so much of the anterior wall in his suture that the lumen is completely occluded. Moynihan in the case of posterior duodenal ulcers opens the duodenum cauterises the ulcer and temporarily closes the duodenum, with an encircling suture. He removes the appendix and investigates the condition of the gall bladder, spleen and liver. The patients in his clinic are most carefully prepared and a post-operative treatment exercised for months including special instructions as to diet and the use of drugs. Moynihan has now had a series of 500 cases of duodenal ulcer without any mortality.

3. *Pylorectomy or Partial Duodenectomy (Pannett).* This method has few advocates. Pannett is the chief exponent of the operation and believes it to be the only way of ensuring freedom from such complications as gastrojejunal ulcer, haemorrhage, recurrence of ulcer, perforation and cancer. He admits the difficulties and dangers of the operation he has devised but thinks the technique can be so improved that these will be rendered neglible. Quoting Finsterer's results (1.4 per cent mortality in 71 cases) in his own series he has had 2 deaths in 29 patients, one from cardiac failure, the other from broncho-pneumonia.

These are the usual types of operation for chronic ulcers in the neighbourhood of the pylorus practised in Great Britain. Amongst surgeons generally it is felt that after a fair trial of medical treatment surgical measures should be adopted as the most effective method of obtaining a cure. The risk is small and in a well-planned operation the results are excellent. The failures after operation are due most frequently to the development of an ulcer at the site of the anastomosis, but even this complication is comparatively rare. The fault must lie in some defect in the technique; maybe a badly planned anastomosis, defective union, too rough sewing, too vigorous clamping (in fact union without the aid of clamps is better and safer), too large or too small an opening, contraction or kinking at the mesocolic aperture, gross anatomical mistakes, operation where there is no observable lesion, want of proper attachment of the opening in the mesocolon. These by no means end the list of possible errors but enough has been said to account for some of the failures which come back into the hands of the physicians.

John H. Watson, M.D., F.R.C.S.
Burnley, England.

NOTICE OF COMPETITION

Istituto Ortopedico Rizzoli in Bologna

THE competition for the prize Umberto I. has been opened. This prize of 3.500 lire will be assigned, according to the decision of the Provincial Council of Bologna, for "the best orthopaedic work or invention." Italian and foreign doctors may take part in this competition. The arrangement of the competition and the assignation of the prize is fixed by the regulations which will be sent to whoever asks for them. Application for the competition should be made to the President of the Rizzoli Institute in Bologna. The competition will close December 31, 1929.

The Commissaire of the Prefect
Avv. Umberto Turchi

Bologna, January 1st, 1929.

[From Fernelius' Universa Medicina, Geneva, 1679.]

BOOKSHELF BROWSING

MEDICINE, CHARLATANRY AND LITERATURE

A PSYCHOLOGICAL STUDY OF QUACKERY

HEINRICH F. WOLF, M.D.

NEW YORK

THE discovery of the basic foundation for the causes of evil conditions alone enable us to build up a method for their improvement. The question, however, as it relates to our subject, is not correctly answered by words like "charlatanry," "quackery" or "fakery." These are only words, which do not lead us to any solution. Those of us who agree with physicians, do not need more enlightening definitions than these, but those who are indifferent or antagonistic to the medical fraternity as a whole will think that we are envious and are not treating them fairly. We must, therefore, try to get at the foundation, or the psychology, of the subject and describe conditions as they exist and the ideas which led to these conditions.

During the last two decades we have heard much about the fight of the medical profession against the various forms of so-called "quackery," politely called "illegal practices,"—the chiropractors, naturopaths, neuropaths, Christian scientists, bone-setters, and so on. We have read about the efforts of the medical men who try to stem the flood of charlatanry, through organization and legislation, from rushing into the field of medical science and carrying away a large number of "victims" whom they call patients. But, in spite of the combined strength of all the efforts of the medical men, one aspiring group after another has wriggled through the loopholes left by the law. And having "wriggled through," they swell and swell with all the pride of the profession they try to imitate. They would die through their self inflation and its resultant ridicule; but the medical profession could not let them die because the events in the interim are too closely associated with life and death.

Physicians do not seem to learn from medical history that invasions of their field cannot be stopped by force; and besides, the medical profession, in many instances, has used very bad judgment to stop it. For a case in point take the hostility which the medical profession showed against the farmer Priessnitz, one of the founders of modern hydrotherapy. This hostility, however, did not prevent his becoming a great healer and being consulted by the highest and lowest the world over. Later, when Winternitz, the father of scientific hydrotherapy took up this work, it was many years before he was able to force the medical profession to acknowledge the value of physical therapeutics. It will

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be remembered that only a few years ago these methods were considered as but a poor form of quackery.

Lately, George Bernard Shaw has taken up the cudgels for the bone-setter, Sir John Barker. He viciously attacks the General Medical Council, representing the medical profession, for not knowing this unquestionably able man. He does not realize that the fault of the General Medical Council does not lie in the fact that they do not acknowledge a bone-setter, but that they do not acknowledge Sir John Barker; or, if you want to express it in medical language, they treat a type instead of treating an individual.

I regret that I do not know Sir John Barker, but I am quite certain that he, like all physicians, must have his failures, only people do not hold them against him. If he fails, people shrug their shoulders and say: "He is only a bone-setter after all." We must not forget that failures give us better judgment of a method than successes. The results which these bone-setters have is probably due to a large extent, to the fact that they resort to treatments so brutal, a physician would not dare to use them. The responsibility of a physician is greater in scope. In this connection I am reminded of an assistant of Winternitz who used truly heroic methods on his patients, real horse cures, which sometimes gave him unexpected results but which, in other cases, did great harm. There are unquestionably, however, laymen who have a natural therapeutic instinct and at times may find a way to a cure which the physician following a routine will not obtain.

The legitimate and justifiable, but unwisely conducted fight of the medical profession against the quacks has produced a bond of mutual interest among the various sorts of charlatans. There is no question that we could get rid of most of them if only we could make the experiment of turning them loose on the poor public. But, of course, this would not be feasible. It would be just as costly as the methods of war to end war.

Let us see whether we could go to the source and try to stop the flood there. The source of quackery and the mainstay of the charlatan is ignorance, not ignorance in the general sense of the term, but lack of specialized knowledge; in the case of the physicians, the ignorance of the educated public to medical matters. My confrères will ask in refutation of this: "Do we not try to remedy this ignorance by enlightenment of the public through lectures?" This is very true but, unfortunately, the best these lectures can do is to disseminate only half-knowledge and half-knowledge is often worse than none at all. Without a thorough knowledge of physiology, anatomy and pathology, an understanding of the phenomena of human life is impossible. Do we not find, even among medical men, the most abstruse, absurd ideas about pathological conditions in branches with which they are not familiar?

I heard someone, this time it was not William J. Bryan, speak of intussusception of the convolutions of the brain. This is laughable, but when one looks at the exposed brain and the exposed intestines, one realizes that there is so striking a resemblance between the external appearances that this expression does not appear as stupid and ridiculous to the lay mind as members of the medical profession know it to be.

Let us take up popular ideas about gases; about colds; about driving a disease from one part of the body to another; these surely cannot become eradicated where the true conception of facts does not exist. Contradictions cannot make themselves apparent where there is no standard of truth.

To the mind practically devoid of all essential premises on which to base a correct conclusion, nothing appears illogical or ridiculous, monstrous or impossible. It is admitted that many an expert has shown himself to be an expert only in conceit because he considered his own limitations as the limitations of the universe. Scarcely one hundred years ago experts declared that human beings could

not breathe while being carried in a train which would hurl them through space at the terrific speed of thirty miles an hour!

To a mind untrained in a particular field and its branches, the most absurd nonsense, the most obvious misstatements will sound as true as Holy Writ. This will explain why men most prominent in their particular field—law, economics, industry or literature—belong to the clientèle of quacks and charlatans. Archbishops and justices of the highest courts, professors of universities and princes of finance, artists of highest repute and authors of world renown have flocked to the charlatans and sworn to their supernatural powers, their knowledge, and their theories.

I do not speak here of miracles and the millions of white people who believe in them. The medicine-man of the savages, of the heathen, is of course a poor swindler. The Hindu who washes off his ills in the sacred waters of the Ganges is ridiculous, though he, at least, gets a bath. But the pilgrims to Lourdes are blessed by the Lord.

What interesting analogies! The old Greek who bowed his head before the wonderful statues of his great masters was a heathen, but those who believe that a certain image of a particular saint has a special power and works miracles, are inspired by God. The poor Chinaman who rattles his prayer-wheel is an idiot, but the clicking of the rosary beads proves the wisdom of the peasant woman.

The object of this article is to show that ignorance in medical matters is not attributed to the intellectuals merely as a matter of hearsay. Laughable misconceptions reveal themselves in the works of modern writers.

Szienkievich, in one of his short novels, lets a boy die from meningitis because he had done too much studying, but I do not want to pass judgment on him. Fifty years ago many medical men may have harbored such an idea. The infectious nature of the disease was not known then. Besides, one could infer that the boy undermined his health by intensive study and acquired a tubercular meningitis.

A pupil of Schopenhauer tried to illustrate this philosopher's ideas about the brutal will in nature, and even committed suicide, carrying his master's thesis to the final conclusion. The author, in his story, speaks of a tenor who had been working and waiting for a chance to sing in public. He was a wonderful artist but when his first chance came he developed pneumonia. Was it astonishing that he did not sing quite as well, having pneumonia, as he would have sung without it? Can the public be blamed which laughed him off the stage? The poor artist died of pneumonia. Had the author possessed an inkling of the nature of pneumonia, or had he ever had pneumonia, I am sure he would have made his hero the victim of walking typhoid.

But let us go on to the present day. Everyone will admit that Arnold Bennett is a talented author. Everyone will likewise agree that he is a poor diagnostician. In his book "Hilda Lessways," he says:

> Sarah Gailey was lulling herself in a rocking chair when Hilda entered. She neither regarded Hilda nor intermitted her see-saw. Her features were drawn into a preoccupied expression of martyrdom and in fact she constantly suffered physical torture. She had three genuine complaints: rheumatism, sciatica and neuritis. They were all painful.
>
> The latest and worst was the neuritis which had attacked her in her wrists, producing swollen joints that had to be fomented with hot water. Sarah Gailey's life had indeed latterly developed into a continual fomentation and a continual rocking. She was so taken up with the elemental business of fomenting and of keeping warm that she had no energy left for other remedial treatments such as distraction in the open air.

I doubt if any of you will take Bennett as a consulting physician.

I do not want to ask your opinion on Henry Barbusse. I like radicals and I like Barbusse's writing, but as a pathologist he is a failure. Note what he says in

"Inferno" about a consultation of two physicians:

The man with the gray beard murmured, "I detect sarcoma." He puts his finger on his neck. "Right here." The other man nodded, (his head seemed to be nodding continually), and muttered: "Yes, there is no possibility of operating." "Of course not," said the old specialist, his eyes shining with a kind of sinister irony. "There is only one thing that could remove it, the guillotine. Besides, the malignant condition has spread. There is pressure upon the sub-maxillary and sub-clavicular ganglia, and probably the maxillary ganglia also. His respiration, circulation and digestion will soon be obstructed and strangulation will be rapid." Then the house physician talks to the young woman, probably his wife. "Sarcoma forms like the human embryo" said the younger doctor. "Yes, like the human embryo," the other assented and entered into a long elaboration of his idea.

"The germ acts on the cell, as Lanceraux has pointed out, in the same way as the spermatazoa. It is a micro-organism which penetrates the tissue and selects and impregnates it, sets it vibrating, gives it another life. But the exciting agent of this intra-cellular activity, instead of being the normal germ of life, is a parasite. The cancerous tissues never achieve full development. It keeps on without ever reaching a limit. Yes, cancer in the strictest sense of the word is infinite in our organism."

This may be a prophecy, but the discrepancies in all of these statements as applied to modern science might be due to the fact that the man who narrates the story sees and listens through a crevice in the wall. Thus he may have misunderstood what the physicians said.

"Man in War" by Andreas Latzko made quite a stir during the war. It is said to be the strongest argument against war. In a chapter of the book called "Baptism of fire," Latzko says:

On slowly recovering his consciousness he found himself buried under a huge mound of earth, with only his head and his left arm free. He had no feeling in his other limbs, he couldn't find his legs. Nothing was there that he could move.

His left hand struggled toward his head and when he succeeded at last in pushing it under his neck, he felt with a shudder that his skull offered no resistance and his hand slid into a warm soft mush. With a superhuman effort he propped his head up on his left hand, high enough to have a view of a few paces along the trench. The captain had to see. He pulled his head farther out from under the mound . . . etc.

There is no fault to find with his principles, but why didn't the author ask a military surgeon for advice?

Could Latzko not have found out by a simple inquiry that when a man's neck is broken he not only cannot hold up his head but his arms are paralyzed, too? Besides, according to the description, the brain was destroyed. The story is gruesome but it would have been just as terrible if he had left the commander lying on the ground suffering from some other wound.

Michael Arlen has written a book called "The Green Hat." It shows esprit, it is full of humor, the language is beautiful. I liked it so much that I actually bought it, though it may show my poor taste. But medical science, as promulgated in it, is truly deplorable. I am ready to forgive Arlen that he lets the first child of the heroine die because it wanted to get out feet first. Arlen does not mean to talk of a breach presentation; he seems really to believe that some children walk out at confinement:

Well, and then—Oh, and then they killed Hector just in time, and when Hector-not-so-proud came along he thought, the poor sweet, that the proper way for a gentleman to arrive in the world was toes first to slow music, and so away he had to go.

Wealthy women, particularly when they are married, have a physician attending their accouchement and we know that at a version the child is delivered feet first. This is not a particularly dangerous form of delivery for the child. But this child had to die for the sake of the plot!

It happens sometimes, even with the best medical attention, that women become

infected at childbirth and get septic poisoning.

It is, however, new to me that a woman thus critically ill, with a temperature of 106°F., cannot get better because "she does not want to live," but does get better through no other remedy than that of seeing her lover. He gives her a new purpose, a new hope for life.

We physicians have seen many a case of septic poisoning where the whole family, the husband, and all the lovers in the world could not help, though the patient wanted to live. "Today we have thought that she will not die," said Sister Virginie, "for last night we gave her a picure du coeur." "Picure du coeur" sounds so well in a book, but would not be crowned with success in real life in a case of septic poisoning. It is not to be wondered at that the doctor who found that ingenious remedy cured the patient so quickly. She was not allowed to move about for weeks, but one month after leaving the hospital: "she drove a car like mad and at the end of the evening saved the life of her friend and adversary, the wife of the lover through whose mere appearance she was cured. She saved her from drowning by jumping into the water after her, in the pitch dark night." It is remarkable that such things do not happen in real life but the author could have waited a few months longer.

All this I can forgive Arlen, but what would a medical man say of the discourse of the physician who treated her? The author does not mention whether it was the same man who infected her at confinement:

> I suppose this is the crisis, Masters? . . . Crisis! The way you people talk of crisis this and crisis that! Hear a word once and stick to it through life. "When does the crisis pass?" There is no "crisis" in most of these infernal things—malaria, pneumonia, a few others—yes, crisis, you know where you are. But in these things the patient just continues ill, two, three, four weeks, might live, might not. Lysis, not crisis.

Crisis in malaria! Lysis in septycemia! Poor Aesculapius! And then people say misdeeds are punished. Surely not in this world!

As poetic license we may take the statement of the heroine, who, six months after her second confinement says: "I am proud of my breasts, because they are so beautiful. Life is generally so rude to a woman's breasts but it has only kissed mine." This, however, is a very common poetic license and he who takes the trouble to read Casanova's stories as well as those of others will be astonished to hear that so many of the numerous sweethearts were equally blessed by nature.

One has to be a great deal more careful with George Bernard Shaw. In his preface to "The Doctor's Dilemma" he viciously attacks the medical profession at large, while he has very kind words for some of his medical friends. There is no question that the medical profession as a body is extremely reactionary, but this phenomenon finds its analogy in mass psychology. Whenever human beings act en masse and thus lose the sense of individual responsibility, the aggregation almost invariably shows the worst traits of the individuals combined.

The great psychologist Shaw should realize that opposition to an intruder is a human phenomenon, in fact a general phenomenon of living matter. Observe what osteopaths did and do to the one who tries to use their methods without official sanction of their governing body.

The question is whether one should open the door to everybody who claims that he can cure people, thus endangering them, or try to protect the patients and harm a few for the sake of the many. I hope that Shaw will be able to agree on one thing; that there must be some kind of protection against ruthless exploitation of the public. Why does he not offer a solution of the problem? How it could be arranged to give to the layman the very difficult training which the modern physician needs before he is allowed to practice; and at the same time give an equal right to men who

have not had this difficult training and so are ignorant, as far as medical science is concerned but who, by instinct, by inborn genius, by special fitness, have acquired the ability to be helpful in a very limited field of human pathology. There is one way, but it is so narrow that human beings who easily swell from conceit cannot travel it. This way would be to disregard rules and to adjust oneself to special situations, to be guided but not determined in one's action by law and precedence.

A friend of mine used to write short articles for country newspapers with the idea of spreading a knowledge of grammar among readers of the paper. Once, for illustration, he quoted at length a very short story of a living author. As soon as the author heard of it he insisted on getting his "honorarium," though he was told that my friend did not get money for his articles, that they were written for purely didactic purposes. Probably Shaw would not do this and it is for this reason he believes that he has the right to object to the medical profession, which prosecutes trespassers, though the trespasser may be a better man than they are.

After all, medical men are human beings first, and must be judged by that standard. There is no question that physicians often act inconsistently. There are men who would willingly burn all osteopaths at the stake, yet will refer a certain patient to an osteopath for treatment. The trouble with present-day medicine is that its scope has so widened that it is hardly possible for an individual to master his own specialty. It cannot, therefore, be wondered at that medical men sometimes give wrong advice when they cannot possibly know all the details of the branch of medicine practiced by a colleague. We can understand that he may condemn methods because he knows nothing about them. Only in this way is it intelligible that the medical profession as a body condemned without examination or justification, Swedish gymnastics, the water treatment and treatments with various electrical modalities.

A great sage once said: "I know that I don't know anything," and for this one remark he deserves to be called a sage, as only the one who knows what he is lacking in knowledge divines how much there is to be known.

In medicine, probably more than in any other science, we appreciate that there are vast unexplored regions. The writer studied bacteriology as a student and as a post-graduate and has followed, to some extent, the progress of this branch of medicine. But not in his wildest dreams would he permit himself to judge authoritatively the results of those men who make bacteriology their special study. Shaw however read, according to his confession, one book on bacteriology which, taking into consideration his preliminary education, he could not understand and yet he passes judgment on the validity of various theories. I wonder what Shaw would say if I were to pass judgment on the literary value of his work on the strength that I understand the English language. But he himself, medical expert only by the grace of George Bernard Shaw and forbearance of the Lord, does not hesitate to teach the public what attitude they may take toward the medical profession and medical science. I read in *The New York Times* of February 12, 1927, that he opened an osteopathic clinic for the poor in London. In a fit of modesty, unusual for him, he said that he was not an osteopath and went on to say: "I am getting into a state of mind where I dare not wander into Westminster Abbey or St. Paul's Cathedral because I know the next day the press would say I founded the Church of England." We may accept his admission that he is not the founder of the Church of England, not an osteopath, not a physician; but he is a man of letters, a man with a logical mind. Does it then not occur to him that by founding a clinic of osteopathy he is committing the same blunder as a physician who is merely an allopath or a homeopath or a hydropath or a what not? Is'nt this onesided too? Is it not obvious

that a physician should be a physician and adjust his methods to the patient instead of the patient to his methods?

Shaw seems to have great faith in the osteopath and the bone-setter. There is no question that some methods of both are valuable. Their value, however, is determined by their physiological action. It is silly to say osteopathy or hydrotherapy or medicines are effective. They are effective only in certain cases because they produce reactions in the body which are desirable in those particular bodies. This is disregarded completely by medical men who indiscriminately condemn a method instead of accepting what is good in that method and using it.

In certain Catholic countries where priests engage in political controversies, we find many individuals of opposing political faith confusing the issue and attacking religion instead of its representatives. The stand that Shaw takes against the medical profession, which is certainly justified to some extent, make him attack medical science, for which attack he is not in the least qualified.

Anyone, being impartial and unbiased and knowing something about medicine, would be highly amused at articles by Shaw in the London Nation, February 3 and 10, 1923. In the fashion of a true medical Don Quixote he argued against inoculation of smallpox from one individual to another, and talked about the dangers of this procedure. As if any sane physician would use anything but cow lymph. He might just as well argue the point of machine guns against bow and arrow. He talked about babies who died after vaccination. He does not realize, evidently, that these deaths were due mostly to inefficient asepsis, simply because he does not believe in asepsis. It has happened that people became severely infected after a manicure and have even died of the infection. I am glad that this is not known to Mr. Shaw. Logically, he would be obliged to go about with dirty fingernails.

It is true that statistics lie; but why call the fact published by the German army, that smallpox was stamped out after 1874 lies, and swear by those of Almroth Wright? "Wer Recht behalten will und hat nur eine Zunge, behälts gewiss."

The stamping out of the plague in Bosnia and Herzegovina after the Austrian occupation by the use of vaccination should convince the most ignorant or bigoted, particularly in view of the fact that any attempt to improve the general hygiene of the inhabitants would have been hopeless.

I quote the following editorial from *The New York Medical Week*, May 21, 1927:

An Unenviable Distinction. To Americans who are accustomed to regard their nation as one of the most progressive in health matters it will come as a distinct blow to learn that during 1926 more cases of smallpox were reported in the United States than in any other country outside of Asia. The doubtful distinction of such a record is the more to be deplored in that smallpox is definitely a preventable disease. Ten European states were entirely free from it in the period under survey and the combined reports of eighteen others amounted to one thousand cases, as compared to thirty-three thousand, seven hundred and fifty-two for the United States alone.

It is notable that the incidence of smallpox follows the same graphic curve as the development of anti-vaccination sentiment. Where inoculation is extensively employed in a community the disease disappears. Let the anti-vaccinationists win a place and within a few years smallpox is seen to be on the rise. Southern California and Northern England are conspicuous examples of this.

Shaw is careful enough not to speak of diphtheria antitoxin and its value. He evidently does not want to know of those things which do not fit his argumentation. He attacks typhoid vaccination and I wonder whether he knows that in the Spanish-American war more soldiers died of typhoid than died of wounds, while in the last war typhoid took proportionally very few victims in all armies.

Does it not occur to the apostles of anti-vaccination that sanitation, which is supposed to have helped to bring about the

decrease in the number of smallpox cases, is of no value in those forms of disease where a specific organism has not, so far, been found and where, on this account, an effective vaccination is impossible. In smallpox we have at least the specific agent, though we cannot identify it.

While we say that people can prove everything they want to by statistics, no sensible person will disclaim altogether their value. Again it must be said that statistics should be weighed carefully, more carefully than Shaw does when he speaks of the success of bone-setters and osteopaths. There are few people who realize that the value of a treatment is characterized more by the absence of failures than by the presence of success. Just as a connoisseur in art proves himself to be one not by the good pieces he has, but by the fact that he has only a few bad ones.

Bacteriology is a very difficult branch of medical science. Few physicians not specially trained would dare to discuss bacteriological problems, but only their practical application. To show how difficult it is to talk logically about such problems unless one knows the details, I may quote one of Shaw's passages from his article of February 10: "As a dead microbe will serve as well as a live one, just as a dead man is as infectious as a live one, it follows that the microbe like the man is the vehicle of and not the prime cause of it." What rubbish! A dead microbe is not infectious but simply poisonous. It is not infectious because it cannot grow; t is poisonous because of the foreign proteids contained in its body. A dead man is infectious not because he is dead, but because he may carry live infecting organisms. And if it is correct that the microbe is not the prime cause of the disease, it is so only because there is never only one prime cause. In fact, there is no cause at all but there are conditions leading to manifestations, which we call disease.

Just lately Shaw took a very decided stand for evolution and against William Jennings Bryan. If I am not mistaken, he speaks in this connection of infantilism; yes, he even speaks of blockheads and does not seem to exclude Bryan from this fraternity. Is it not strange that Shaw, who knows all about infantilism in the theory of evolution, does not know enough about infantilism in medicine?

How are such errors possible in the books of authors of repute? They do not ask for advice because they are not aware of the blind spot in their minds.

I have no reason to belittle these authors whom I really admire for their literary qualities. Such mistakes are amusing to the medical man, and they do not necessarily interfere with the beauty of the writing. The anachronisms found in Shakespeare have not prevented us from regarding him as the greatest dramatist of all times. To me they prove simply how very unsophisticated even the intellectuals are in medical matters. When such things occur nowadays with the best in the land, what then can we expect from the rank and file?

Nothing amuses me more than the attitude of the general public that the possession of a body connotes knowledge of it. With what glibness they talk of the most difficult subjects in the world, difficult even to the trained medical man! They are prone to ridicule a wrong diagnosis because they do not realize the utter impossibility in some instances of making a correct one. They are not aware of the fact that even if it is possible to make a diagnosis and classify a disease, the cure of that disease might be impossible. If a man has a run-down automobile he throws it on the junk-heap, but he thinks a run-down body can be exchanged part for part.

If would be very helpful all around if people would realize that physicians are not endowed with divine power. In fact, I may go so far as to say that the most highly trained and scientifically minded physician is the most human of individuals, as the clear light of knowledge dispels the clouds of pseudo-sanctity in which the medicine-man and the charlatan are mysteriously robed.

Unfortunately, a large part of the public takes note only of the shortcomings of the medical man and recognizes only reluctantly his accomplishments, just as we notice the shoe that pinches us but are unconscious of the one we wear in comfort.

Patients often complain of medical ethics. There cannot be any question that medical ethics are extremely immoral. If it is true that the welfare of the patient ought to be the highest law, then ethics must be revised, as they constitute a flagrant violation of this law. If we look at it historically, we can understand that medical ethics are a necessity. So long as medical science has not become an absolutely exact science, and this it never will be, so long as the scope of this science is widening and an all-around knowledge and thorough experience in all branches is more and more difficult, discrepancies among doctors both in regard to diagnosis and to treatment must arise daily. Without medical ethics some consultations would be disastrous. They are bad enough now but without the restraint of medical ethics the situation in the medical profession would be deplorable and the one who would suffer most by it would be the patient.

But do patients not suffer now? Certainly! Very often they do, but the question is not to cast Satan out by Satan, to abolish medical ethics and make matters worse, but to modify them, modernize them, keep them alive. To keep a law alive does not mean to carry it out to the letter like a petrified statute but to allow it to grow and to change according to conditions. Life means Change.

On the other hand, every now and then one reads of the various efforts medical men make to check charlatanry; and plans are now afoot to establish psychiatric clinics to help young students and medical men to cope with these evils. Fruitless labor! As long as there are incurable diseases, as long as there are conditions which are not understood by medical men or which are not properly treated, as long as there are conditions which cure themselves and for which credit is given to the one who treats the case last, quacks will flourish. They will flourish because the quacks, on account of their own ignorance, can talk to patients nonsensically enough to be fully understood. Where a definite pathological process exists, patients will suffer, but the degree of suffering depends upon their state of mind. Fear, worry, anticipation of trouble, may interfere with the curative action of the body. It is here that Christian Science methods show their results. Many a patient would get along better if the physician could afford to let the case take its normal course and if the patient would stand for it. Many patients become indignant if one tells them that they will get well without treatment, but that it will take time. Many patients prefer to have medical treatment, others really enjoy having bad health. Others again see in their troubles a method of dominating their surroundings.

Even among physicians it is not generally appreciated that the manifestations are not disease itself, but the reaction to disease-producing agencies. It is generally forgotten that there are no diseases, but only sick people and that we are long past the stage when we looked on disease as a demon who had entered the body and who could be driven out.

To return to our original statement: We can say that charlatanry is not primarily due to the fact that people want to be humbugged, as Edgar James Swift said in *Scribner's Magazine* of October 1925, though we cannot deny that this may be one of the psychological roots; the primary basis is lack of education in medical matters. It sounds strange that an individual who is well trained in medical matters, such as a physician, is often more easily fooled than a layman, because he wants to be. I have seen many colleagues suffering from malignant diseases fooling themselves intentionally into a state of hopefulness. These physicians pretend to themselves only regarding the outcome of

the disease, but they do not go to charlatans for treatment.

Unless education in medical matters becomes a great deal more diffused, a change in the attitude of the public cannot be expected. It is, however, advisable to keep the fact before the eyes of the public that the lack of medical knowledge in an individual is an insufficient guarantee of his superior ability as a healer.

Forcible methods will never succeed because the ignorant public will always side and sympathize with the man whom they consider unjustly oppressed. If they were aware of the incapacity of the charlatan they would not go to him and these poor devils would starve. But if they do believe in them, no legislation on earth, no arguments as to the dishonesty of their practices, will be of any avail.

BOOK REVIEWS

The key-note of A Textbook of Surgical Diagnosis,[1] as expressed by the author in the preface, is his statement that among surgeons "the opinion has been widely expressed that the weakness of modern surgery lies in diagnosis." With this statement few surgeons will quarrel. His further statement that "there is . . . a growing tendency to lay stress, and perhaps undue stress, upon the value of laboratory and other special methods of investigation." These volumes, edited by Dr. Walton, contain over 1100 pages with almost 600 illustrations. Each chapter is written by a specialist of the first rank and the editor has succeeded well in correlating the various articles so that they make interesting successive reading and almost any surgeon will find this book useful to have at hand when faced with a puzzling problem of diagnosis. Authoritative and concise, well printed and substantially bound, this book is entitled to a place in the library of every surgeon.

The committee on publications of the Mayo Clinic states in the foreword of Collected Papers of the Mayo Clinic and the Mayo Foundation,[1] the nineteenth volume of the series, that:

"Papers of interest to the greatest number are presented in full, those in more limited fields of medicine are abridged or abstracted and those in special fields are indexed according to the journal reference. This arrangement was made necessary in order to keep the annual collection within the limits of one volume. It is believed that the arrangement also best serves the reader."

When it is realized that this statement is the necessary preamble to a volume representing the literary out-put for only one year of a private medical institution it is almost the equivalent of writing a new chapter in the history of medicine, not only of America, but of the world.

There are 1330 pages presented, of vitally interesting material, by the active workers in the world's largest surgical clinic. This annual volume is a necessary addition to every medical library worthy of the name.

A concise and thoroughly practical manual of surgical anatomy is here presented in a fourth edition. Manual of Surgical Anatomy[2] is well written, well illustrated and well printed, and may be recommended both to students and young practitioners.

Tumors Arising from the Blood Vessels of the Brain[3] is a most concise, thorough, and authoritative work such as we have come to expect as a matter of course from the pen of the senior author. Surgeons operating on the brain will not fail to add this book to their own library; others will want it in the local libraries for convenient reference.

The book is divided into two parts, first, "The Angiomatous Malformations," and second, "The Hemangioblastomas." Each part is followed by a complete bibliography. The illustrations are beautiful and unusually well reproduced. The typography is splendid, though the copying of the German method of emphasizing by letter spacing and extra leading

[1] A Text-book of Surgical Diagnosis. Edited by A. J. Walton, M.S., F.R.C.S., B.SC., M.B. N. Y., Wm. Wood & Co., 1928.

[1] Collected Papers of the Mayo Clinic and the Mayo Foundation for 1927. Vol. XIX. Edited by M. H. Mellish and H. B. Logie. Phila., W. B. Saunders Co., 1928.

[2] Manual of Surgical Anatomy. Ed. 4. Revised and enlarged. By Charles R. Whittaker, F.R.C.S. (Edin.) F.R.S.E. N. Y., William Wood & Co., 1928.

[3] Tumors Arising from the Blood Vessels of the Brain. By Harvey Cushing and Percival Bailey, Springfield, Ill., Charles G. Thomas, 1928.

distracts from easy reading as well as from the beauty of the page. Authors and publisher have worked harmoniously in the production of a new classic and both are to be congratulated.

The second edition of what may be considered the standard in roentgen therapy has just been issued from the press of Barth with contributions by the leading men of Germany. Lehrbuch der Röntgenkunde[1] shows evidence of the most careful editing and may be considered as a compilation of all that is authoritative and authentic on the subject of roentgen therapy up to the minute of publication.

Worthy of special mention is the chapter by Seitz on "Roentgen therapy and Gynecology." The article on "Neoplasm" by Reader and Groshy is written in just the right tone of conservatism. Throughout the work the enthusiasm of the special pleader has been well checked to accord with modern, conservative, scientific proposals and it is felt by the reviewer that any physician may turn to this book for some time to come, for a concise and authoritative statement of what may and what may not be expected from roentgen-ray therapy in any given condition. This volume is another monument to German *Gruendlichkeit*.

The third volume of Internationale Radiotherapie[2] is before us in a book of 329 text pages, another tribute to the diligence of the Editor. The book is thoroughly up-to-date and has truly an international flavor and will be found invaluable by everyone interested in any way in radium, roentgen or light treatment.

The review of the second edition of Die Chirurgie der Brustorgane[3] published in The American Journal of Surgery in March, 1921 spoke of a future edition which its inherent worth would surely command. This prophecy has been fulfilled and to such an extent that the 916 page volume before us is only volume one, part one of the new edition. More elaborate and complete than ever this third edition of this classic will maintain its preeminent place as the international standard on surgery of the breast. With Teutonic *Gruendlichkeit* Sauerbruch and his collaborators have covered the entire subject and this volume alone contains 916 illustrations, many of them beautiful four-color plates. The omission of American references mentioned in the review of the second edition is still noticeably missing in the text but there is no bibliography in this volume and it is possible that this omission will be rectified in bibliographies included in later volumes. The question that comes to the mind of the reviewer "why can't American publishers produce a work of this kind?" is perhaps answered by the price of 288 marks which is charged for this volume alone. It is, after all, inconceivable that many copies of an American book could be sold at such a price and this despite the fact that the book is intrinsically worth it. While the specialists will find it absolutely essential to add this book to their personal library it is hoped that it will be made available for reference in every medical library in the country.

Translated by a radiologist and an orthopedist, this book by the French masters Leriche and Policard on The Normal and Pathological Physiology of Bone—Its Problems,[1] covers exactly the subject of its title. It does it completely and well and the authors have the courage of their convictions in that they take a definite stand on practically every controversial point. The reader will often disagree with the authors but he will find in this book the evidence on which the authors' opinion is based so that he may form his own conclusions. The subject is one of the utmost importance to surgeons and orthopedists and the book is so thorough and complete that we have no hesitancy in recommending it for inclusion in every medical library. A bibliography with about 250 titles and a good index complete one of the most satisfactory monographs we have seen in a long time.

The long awaited book[2] by Sicard and Forestier on lipiodol is now before us. It is a

[1] Roentgentherapie. Volume iii. Lehrbuch der Röntgenkunde. By Hermann Reider and Josef Rosenthal. Leipz., J. A. Barth, 1928.

[2] Internationale Radiotherapie. Vol. iii. Edited by J. Wetterer-Mannheim. Darmstadt, L. C. Wittich, 1928.

[3] Die Chirurgie der Brustorgane. By Ferdinand Sauerbruch and Others. Ed. 3. Vol. i, Part 1. Berl., J. Springer, 1928.

[1] The Normal and Pathological Physiology of Bone. By R. Leriche and A. Policard. St. Louis, The C. V. Mosby Co., 1928.

[2] Diagnostic et Therapeutique par Le Lipiodol. By J. A. Sicard, M.D. and J. Forestier, M.D. Paris, Masson et Cie, 1928.

pity that this book is not available in English for it is the only authoritative source for definite information on a subject of the greatest importance to surgeons and roentgenologists. The book not only covers, as its title indicates, the question of diagnosis and therapeutics with lipiodol, but it goes thoroughly into the chemistry and physiological action of this important new subject. The fear at first entertained by American surgeons of the administration of a foreign substance into the spinal canal and having it remain there indefinitely has, according to the authors, been entirely overcome by the clinical experience showing definitely that it is absorbed and disappears in a reasonable length of time without leaving any harmful effect.

An der Schwelle der Chirurgie[1] is a book of philosophical discources of a prominent French surgeon found worthy of translation into the German, than which no appreciation or praise could be higher.

The last few years have witnessed a distinct tendency in medicine to resurrect an interest in the patient himself as a biological entity, rather than to confine that attention to the particular disease or disorder with which he may be for the time afflicted. In this country, George Draper in his studies on human constitution has emphasized the relationship of the disease to the patient in the field of internal medicine; in Germany, Brugsch and Lowy, in a monumental and as yet uncompleted work, deal with the biology of the individual from every conceivable aspect. There has now appeared Konstitutionspathologie in der Orthopädie Erbbiologie des Peripheren Bewegungsapparates[2] which treats the question from the standpoint of orthopedics.

The first section of the book deals with a general statement of the present conception of heredity and genetics, and of the methodology of such investigations as they apply to the material under discussion. Then follow chapters on the biological aspects of the various orthopedic conditions, discussed in great detail, with numerous illustrative charts and tables.

The bibliography is exceedingly extensive. The collection of such widely scattered material represents a vast amount of patient research.

The book fills a real need. Those interested in the principles of orthopedic surgery will value it highly as an addition to the present knowledge of that subject.

[1] An Der Schwelle Der Chirurgie. By Emile Forgue. Leipzig, F. C. W. Vogel, 1928.

[2] Konstitutionspathologie In Der Orthopädie Erbbiologie Des Peripheren Bewegungsapparates. By Berta Aschner and Guido Engelmann. Berl., Julius Springer, 1928.

According to the publishers, "This is the life-story of an unusual man, a man who loved animals and made them love him, who made pets of a fox, a coyote, a wild boar, who broke a pair of buffalo calves to harness, who won the confidence of a wild mother skunk, and who wrote accounts of his experiences that were no less true than fascinating, for if he loved the wild things he loved truth no less. All who are interested in wild life and its conservation, all who enjoy a well-told story of courageous and active life, will enjoy this book."

Ernest Harold Baynes[1] is divided into 14 chapters under the following heads: Fine Metal; A Youthful Naturalist; Leaving the Highway; No Place Like Home; The Fight to Save the Buffaloes; Lecturer and Letter Writer; A Champion for the Birds; Writing, Lecturing, and Acting; A Trip Abroad; Adventurers in the Eternal City and the Near East; The Fight for Truth; Sidelights; The Last Fight; Immortality. The one of interest to physicians and the one that the publishers overlooked in their blurb is number eleven "The Fight for Truth." In this chapter is told the work of Ernest Harold Baynes anti anti-vivisectionists.

Medical science never had a more ardent or able advocate than the subject of this biography. As executive head of "The Friends of Medical Progress," Ernest Harold Baynes, naturalist and lover of animals, fought the battle of scientific medicine with a vim, fervor and zest that invariably put to rout those usually well-intentioned but misguided souls who rally to the battle cry of antivivisection. That the question of vivisection has emerged from the debatable stage is largely due to Ernest Harold Baynes whose entire life exemplified the friendship of man for animals.

If for nothing else than as a token of appreciation from the profession for which he did so much, this interesting life of Ernest Harold Baynes deserves a prominent place in the library of every American physician.

A very exhaustive study of the problem of gonorrheal arthritis is to be found in

[1] Ernest Harold Baynes. By Raymond Gorges. Bost., Houghton, Mifflin Co., 1928.

Les Arthrites Gonococciques[1]. It is a thorough discussion of the etiology, the pathological anatomy, the symptoms and the therapy recommended in this most dreaded affection of the joints. The author, a surgeon, gives an impartial account of all the opinions expressed in the literature and quotes views, and contradictory statements of the many men who have written on this subject.

The American physician will miss the more exact differential diagnosis between the true gonorrheal arthritis and the forms caused by Streptococcus viridans and similar organisms. Many cases described bear the earmarks of arthritis other then the gonorrheal one.

The discussion of the various treatments illustrates the disastrous habit of treating patients according to classifications, and for the purpose of demonstrating the value of a treatment the author offers interesting reading.

Though the writer as a surgeon is in favor of surgical interference he is very impartial in his judgment of others, no matter how skeptical he may be. He is impartial to a fault.

A complete list of the entire literature on this subject closes the book.

As a guide in the treatment of gonorrheal arthritis the book will fail most physicians, just on account of its fairness. As a book of reference it can hardly be surpassed.

The second edition of the monumental work Klinische Röntgendiagnostik des Verdauungskanals[2] appears with a preface by the famous Sauerbruch indicating its interest to surgeons as well as to roentgenologists. A complete, thorough, and well-written text on the roentgenology of the digestive tract, this book with almost 900 illustrations is produced in Springer's best style which leaves little to be desired.

A bibliography of 73 pages comprising over 2500 titles! There's testimony to the germanic *Gruendlicbkeit* of the author, and this thoroughness is not to be questioned despite the fact that of the numerous articles by the American, Walter Alvarez, whose contributions may be considered classics of roentgen literature, only one was found worthy of citation. As against this there are listed 14 articles by James T. Case, 10 by A. R. Carman and 2 by F. W. Manges, indicating that American literature has not been entirely slighted.

There can be no question but that this book is an invaluable addition to the library of the roentgenologist and also of great value to the surgeon.

The author and the publisher of the delightful book Troubles Fonctionnels et Dystrophies a L'Etat Chronique en Gynecologie[1] have turned out an unusually good piece of work. The anatomic and physiological division is concise and clear-cut, and of value to all students of the subject. A section deals with neurophysiology and could well be studied by all gynecologists and endocrinologists. The operative suggestions would hardly be accepted in toto by American surgeons, but are interesting and give much food for thought.

The pictures of uterograms contained under the heading of "Treatment" are not quite as clear as one might desire, and the conclusions from these roentgen-ray studies are not entirely satisfactory. The pictures of operations on the cervix are unusually good. About fifty pages are devoted to roentgen-ray diagnosis and cover the subject quite fully. At the back of the book are some thirty pages of drawings of various operative procedures, and they are very clear-cut and extremely instructive. The book has undoubted value for both the student and the specialist along this line of work.

[1] Les Arthrites Gonococciques Gonorrheal Arthritis). By H. Mondor. Paris, Masson et Cie, 1928.

[2] Klinische Röntgendiagnostik des Verdauungskanals. By H. Chaoul, M.D. Edited by E. Stierlins. Berl., Julius Springer, 1928.

[1] Troubles Fonctionnels et Dystrophies a L'Etat Chronique en Gynecologie. By Paul Petit-Dutaillis. Paris, Gaston Doin & Cie, 1928.

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